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LIST OF PAPERS

Bequaert (J.)
Notes on Oriental Polistes Wasps. (Hymenoptera: Vespidae) 265
(Issued December 6, 1940)

Blaisdell (Frank E., Sr.)
A Monographic Study of the Species Belonging to the Melyrid Genus Trichochroides. (Coleoptera) 283
(Issued January 31, 1941)

Studies in the Melyridae. No. 12. (Coleoptera) 319
(Issued January 31, 1941)

Braun (Annette F.)
Notes and New Species in the Yponomeutid Group. (Microlepidoptera) 273
(Issued December 31, 1940)

Fox (Richard M.)
A Generic Review of the Ithomiinae. (Lepidoptera: Nymphalidae) 161
(Issued September 18, 1940)

Linsley (E. Gorton)
A Revision of the Genus Oreopasites. (Hymenoptera: Nomadidae) 307
(Issued January 31, 1941)

Pate (V. S. L.)
The Taxonomy of the Oxybeline Wasps. (Hymenoptera: Sphecidae). I. A Review of the Genera Belomicroides, Brimocellus and Belomicrus, with Particular Reference to the Nearctic Species 1
(Issued April 29, 1940)

II. The Classification of the Genera Belomicrus and Enchemicrum 209
(Issued September 18, 1940)

REHN (JAMES A. G.)
The Application, Relationship and Species of Scyllina and Scyllinops. (Orthoptera: Arcididae; Acridinae) 101
(Issued May 23, 1940)

ROBINSON (MARK)
Studies in the Scarabaeidae. (Coleoptera). II. 141
(Issued July 25, 1940)

WILLIAMS (R. C.) and BELL (ERNEST L.)
New Neotropical Hesperiidae and Notes on Others. (Lepidoptera) 121
(Issued May 23, 1940)

TRANSACTIONS
OF THE
AMERICAN ENTOMOLOGICAL SOCIETY

VOLUME LXVI

THE TAXONOMY OF THE OXYBELINE WASPS

(HYMENOPTERA: SPHECIDAE)

I. A Review of the Genera Belomicroides, Brimocelus, and Belomicrus with particular reference to the Nearctic Species

BY V. S. L. PATE
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The Academy of Natural Sciences of Philadelphia

(Plates I and II)

There is no group of the Sphecoid wasps which, on the whole; is more interesting or highly specialized than the Oxybelines, yet half a century has elapsed since any comprehensive treatment of the North American forms has appeared. In the years intervening between 1889, when Robertson presented his modest little synopsis of the North American species of *Oxybelus*,[1] and the outbreak of the World War in 1914, these curious and bizarre little forms attracted the attention of various investigators on this continent, particularly Baker, Cockerell and Rohwer. During that period, papers describing new forms appeared sporadically from time to time, increasing the number of species from the fourteen recognized by Robertson to a sum total of some seventy species. With the publication of each paper, however, our knowledge of the Nearctic forms became more and more chaotic. This was unfortunate, for it has become increasingly apparent that the economy of these small wasps, particularly the members of the typical genus *Oxybelus*, is, as I have indicated elsewhere,[2] of some importance to man. But this [illegible] of any revisionary work on the Nearctic forms has [illegible] compensatory features. For in the meantime [illegible] fauna of other regions, especially that of [illegible] and the Philippines,[5] has been the [illegible] so that we are now in a better [illegible] interpret the complex picture these wasps present in the Nearctic region.

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[1] Trans. Amer. Ent. Soc., XVI, pp. 77-85, (1889).

For some years I have been assembling the necessary data for a series of comprehensive papers under the general title given to this study. In these, it is planned to present a critical survey [illegible] the taxonomy and biology of the Oxybeline wasps, with particular reference to the North American forms. The present paper is the first of the series, and reviews the genera *Belomicroides*, *Brimocelus*, and describes the Nearctic species of *Belomicrus*; the remaining papers will follow shortly. Certain generalities such [illegible] a discussion of the origin and evolution and the distribution of the Oxybelines will be presented in later papers.

To the many institutions and individuals who have generously loaned me material and patiently awaited its return, I wish to acknowledge at this point my deepest thanks and gratitude. The help and cooperation of each and every one will be carefully and fully acknowledged in a later paper of this general series. At this juncture, however, I wish to express my thanks particularly to Dr. P. H. Timberlake of Riverside, California, for sending me excellent material of this group as the following pages bear eloquent testimony; to Dr. Franz Maidl, Kustos of Entomology at the Naturhistorisches Staatsmuseum in Vienna for the loan of many species of *Belomicrus* and especially a number of the types of the late master hymenopterologist, Franz Friedrich Kohl; to Dr. George Arnold, Director of the National Museum of Southern Rhodesia, and Captain R. H. R. Stevenson, both of Bulawayo, Southern Rhodesia, for sending me South African Oxybelines.

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[2] Philippine Journ. Sci., LXIV, pp. 374-375, (1937 [1938]).

[3] Kohl, F. F. Die Hymenopteren-Gattung Belomicrus A. Costa (s.l.). *Konowia*, II, pp. 1-25; 180-202; 258-278; (1923). *V. et.*: Maidl [*in* Schmiedeknecht], Die Hymenopteren N. u. Mittel-Europ., Zw. Aufl., pp. 660-666, (1930); and Berland, Faune de France, X, pp. 203-212, (1925).

[4] Arnold, G. The Sphegidae of South Africa, Part VIII. *Ann. Transvaal Mus.*, XII, pp. 55-115, (1927).

[5] Pate, V. S. L. The Oxybeline Wasps of the Philippines, with a Synonymic Catalogue of the Described Oriental Species. *Philippine Journ. Sci.*, LXIV, pp. 373-395, (1937 [1938]).

Tribe OXYBELINI

The Oxybeline wasps constitute a compact and natural group of the subfamily Pemphilidinae (*olim* Crabroninae), and have been derived in all probability from an ancestral stock of the general nature of *Karossia* or *Encopognathus*. The chief differential features separating the Oxybelini from the two other tribes: the Karossiini and Pemphilidini, are the complete absence of the basal abscissa of cubitus in the fore wing, thus causing the first submarginal and first discoidal cells to be confluent, and the presence of but one apical calcar on the middle tibiae. Furthermore, the Oxybelini are unique amongst the Sphecoids in that practically all the component species are provided with flat, laminate, variously formed, alate lateral expansions of the postscutellum—the squamae, while the propodeum is usually armed with a median dorsal, backward projecting, protean-shaped process—the mucro.

Tribal characters.—Small forms. Compound eyes elongate-oval, reaching to the bases of the mandibles below; inner orbits parallel, subparallel, or occasionally slightly divergent above and below. Malar space wanting or reduced to a mere line. Ocelli normal. Antennae always distinctly thirteen-segmented in males and twelve-segmented in females, usually situated low on face on dorsal margin of clypeus. Clypeus transverse. Labrum concealed or inflexed beneath clypeus. Mandibles more or less falcate, simple and acute apically; inner margins notched, dentate, or with an obtuse angle medially; lower margins varying from entire to distinctly excised medially.

Thorax relatively stout. Pronotum narrow, transverse, the tubercles never attaining the tegulae. Postscutellum in the majority of forms with alate lateral expansions, the squamae. Propodeum usually with a median dorsal, backward projecting process, the mucro. Mesopleura with the episternal suture passing vertically from below the tegulae; omauli and episternauli absent; hypersternauli[6] present, obsolescent or absent; discoposteriorly usually with a small pit.

Fore wings with the stigma small and six closed cells present: the costal, median, submedian, marginal, cubitodiscoidal, and second discoidal cells; the marginal cell elongate, more or less lanceolate and with a small appendiculate cell present or absent; only one submarginal or cubital cell present and this confluent with the first discoidal through the atrophy of the basal abscissa of cubitus; venation obsolete distad of the cubitodiscoidal and second discoidal cells. Hind wings with three closed cells present: the costal, median, and submedian cells; radial vein perpendicular, the transverse cubital vein inclivous, the cubitus arising far beyond the transverse median vein; stubs or traces of the radius, cubitus and discoidal veins often apparent projecting distad of the median cell; the anal lobe small, shorter than the submedian cell; the anal furrow and the axillary fold divergent distad, the anal and axillary excisions remote.

Legs with the claws small, simple, edentate; pulvilli distinct; middle tibiae with one apical calcar.

Abdomen sessile, always with six clearly visible segments in the female and seven in the male sex; pygidium, when present, usually trigonal in female, and quadrate to subrectangular in male. Male genitalia highly modified and very simple, consisting of merely a basal ring, the cardo, a pair of simple, elongate, more or less terete claspers, the volsellae, which are never flattened as in the Pemphilidines, and the closely appressed valves of the penis which may be incrassate or uncinnate at apex.

As here understood, the Oxybelini comprise five genera: *Belomicroides*, *Brimocelus*, *Belomicrus*, *Enchemicrum* and *Oxybelus*. The South African genus *Karossia* which Arnold described in 1929 cannot be referred to the present group, for the basal abscissa of cubitus of the fore wing is present and the middle tibiae are furnished with two apical calcaria. In 1936, I proposed a tribe coördinate in rank with the Oxybelini and the Pemphilidini for its reception.[7] Arnold in 1936 erected a separate subfamily for the primitive genus *Belomicroides*,[8] but as I have indicated on a following page in the remarks under that genus, there is insufficient evidence in my estimation for excluding it from the Oxybelini.

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[6] *Hypersternaulus* (i): A horizontal furrow or suturoid impression running caudad from the lower end of the episternal suture to the meso-metapleural suture just above the articulation of the middle coxae. Apparently distinct from either the sternaulus or episternaulus.

[7] Entom. News, XLVII, p. 151, (1936).

[8] Occ. Pap. Rhodesian Mus., no. 5, p. 38, (1936).

Key to the Genera of Oxybelini

1. Postscutellum simple, not provided laterally with squamae; propodeum simple, not furnished with a median dorsal process—the mucro, nor with lateral carinae; last abdominal sternite of female strongly compressed and provided with a high median longitudinal lamelliform keel; abdomen of male with transverse villous grooves near bases of third and fourth tergites; psammophore present, well developed in female, vestigial or rudimentary in male; (African forms). *Belomicroides* Kohl

   Postscutellum armed laterally with squamae, or at least with alate lateral expansions; propodeum usually furnished with a mucro; abdomen not as above 2

2. Abdomen with the first five tergites (and six in the males) abruptly flexed under at the sides so that the ventral and dorsal portions form a sharp edge at their junction; sternites flat or relatively so; fore wing with the appendiculate cell, if present, very small, so that the marginal cell appears lanceolate or acute at apex; last tarsal segment not swollen; females with a psammophore; (widespread). *Belomicrus* A. Costa

   Abdomen with the tergites not sharply flexed under at the sides, and a sharp edge not present except on first two tergites; sternites convex; females without a distinct psammophore 3

3. Pronotum situated distinctly below the level of the mesonotum; propodeum without lateral carinae; postscutellar squamae poorly developed, merely alate lateral expansions of the postscutellum; fore wing with the appendiculate cell, if present, very small, so that the marginal cell appears lanceolate or acute at apex; last tarsal segment not swollen; no distinct tarsal comb present; (South African forms). *Brimocelus* Arnold

   Pronotum not situated much below the level of the mesonotum, but usually more or less on a level with it; propodeum with distinct lateral carinae; postscutellar squamae always distinct and well developed; fore wing with the appendiculate cell distinct and usually wide so that the marginal cell appears more or less truncate at apex; last tarsal segment swollen; tarsal comb present and well developed, at least in the female sex 4

4. Mesepisternum with a vertical carina just before the middle coxae; scutellum and postscutellum longitudinally carinate medially; puncturation of body usually coarse; (widespread) ......*Oxybelus* Latreille

   Mesepisternum without a carina before the middle coxae; scutellum and postscutellum ecarinate medially; puncturation of body usually more subtile; (Nearctic forms) ....*Enchemicrum* Pate

BELOMICROIDES Kohl

Belomicroides Kohl, Ann. K. K. Naturhist. Hofmus., Wien, XIV, p. 312, (1900).—Arnold, Ann. Transvaal Mus., XII, p. 55, (1927).—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).—Pate, Bull. Soc. Hist. Nat. Afriq. Nord, XXII, p. 111, (1931).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 12, (1937).—Pate, Philippine Journ. Sci., LXIV, p. 375, (1938).

Belomicroidinae Arnold, Occ. Pap. Rhodesian Mus., no. 5, p. 38, (1936).

Belomicrus (*Belomicroides*) Kohl, Konowia, II, p. 7, (1923).—Schulthess, Bull. Soc. Hist. Nat. Afriq. Nord, XVII, p. 219, (1926).

Oxybelus (*Belomicroides*) Schulthess, Konowia, IV, p. 187, (1925).

GENOTYPE: *Belomicroides Schmiedeknechtii* Kohl, 1900. (Monobasic.)

The absence of both the postscutellar squamae and the propodeal mucro differentiate *Belomicroides* from all the other genera of the Oxybelini. Furthermore, the third and fourth abdominal tergites of the males are furnished with transverse villous grooves basally, while the females have the hypopygium strongly compressed and provided with a high median lamelliform keel. Neither of these features is exhibited by any other members of the tribe.

Generic characters.—Small forms. Head suborbicular in anterior aspect; front wide and flat, without prominences or excavations; eyes elongate-oval, reaching to the bases of the mandibles, the malar space absent or reduced to a mere line, the inner orbits parallel, subparallel, or arcuate and slightly divergent above and below, with all facets equal; vertex with the ocellar area sometimes elevated, otherwise simple; ocelli normal, disposed in a low triangle or a curved line, the postocellar distance longer than the ocellocular line, usually no oblique sulcus or furrow from hind ocelli to dorsal margin of eyes present. Antennae short, thirteen-segmented in male, twelve-segmented in female, situated low on face on dorsal margin of clypeus. Clypeus flat laterally to tumid discally, with a well developed projecting median lobe. Labrum hidden beneath clypeus. Maxillary palpi six-segmented, labial four-segmented. Mandibles acute at apex; inner margins with a blunt dentiform angle medially; lower margins usually distinctly excised medially. Psammophore present in both sexes, the mandibular, temporal, humeral and femoral ammochaetae distinct in female, but rudimentary or vestigial in male.

Thorax broad and stout. Pronotum narrow, transverse, not sunk below the level of the mesonotum, the tubercles not reaching the tegulae. Mesonotum relatively flat to tumid, not strongly arched anteriorly; suture between mesonotum and scutellum impressed but not widened laterally; scutellum and postscutellum simple, the latter without squamae or alate lateral expansions. Mesopleura with the episternal suture descending vertically from below tegulae, omauli and hypersternauli absent, discoposteriorly with a small pit; no precoxal carina before, nor supracoxal tooth above middle coxae. Propodeum simple, without a mucro, well developed lateral carinae, or a distinctly demarcated discal areole on posterior face although sometimes with a small foveoid impression medially.

Venation as in *Belomicrus,* except that the transverse cubital vein of the fore wing is oblique and reclivate.

Legs with the femora subfusiform; the hind pair straight, not bowed. Tibiae obterete, the middle and hind pair strongly spinose on extensor surface; middle tibiae with one apical calcar, the hind tibiae with two long calcaria apically. Tarsi spinose, the last segment simple not swollen; claws simple; pulvilli distinct. Females with a pecten on fore tarsi. Males with an oblique sulcus on anterior surface of fore coxae.[9]

Abdomen sessile, subovate; tergites not abruptly flexed under at the sides but folded under roundly to the venter and imbricate with the sternites which are convex; second to fourth or third and fourth tergites with transverse basal grooves which are villous in the males; ultimate tergite with a pygidial area which is trigonal in the females, and trapezoidal in the males; hypopygium of female compressed laterally to form a high carina or lamelliform keel which is free and rounded at apex.

Remarks.—Kohl originally proposed *Belomicroides* as a discrete genus, but subsequently in 1923 reduced it to the rank of merely an "Artengruppe" (*i.e.* subgenus) of *Belomicrus,* basing his action largely upon the similarity in venation of the two groups.[10] Arnold, on the other hand has consistently averred. *Belomicroides* is scarcely Oxybeline in character and in 1927 remarked ". . . it should be understood that it is distinctly separated from that group.'[11] However, I cannot agree with either of these views There are congeries of characters, as set forth in the foregoing key and generic characterizaton, wherein *Belomicroides* differs from *Belomicrus* and which indubitably entitle this group to be accorded the rank of a discrete genus and indicate without shadow of doubt that it represents a natural group and not merely an artificial product of the taxonomic mind. But I do not believe there is sufficient justification for excluding *Belomicroides* from the Oxybelines and erecting a separate subfamily for its reception as Arnold did in 1936.[12] The venation of the wings and the general facies of the head, thorax, abdomen and legs is essentially Oxybeline in character. The presence of such peculiar abdominal characters as the villous grooves in the males and the laminately keeled hypopygia of the females may be interpreted as merely individual idiocratic features of the genus, while the absence of the squamae and mucro are merely proof of the essentially primitive and generalized nature of the genus. These characters cannot be adduced as evidence for the creation of a separate supergeneric group for *Belomicroides.*

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[9] This is the case in *pictus* and *maurusius*; the males of the other three species are still unknown.

[10] Konowia, II, pp. 8-9, (1923).

[11] Ann. Transvaal Mus., XII, p. 55, (1927).

Despite certain obviously specialized characters like the abdominal features alluded to above, *Belomicroides* is without question the most primitive existing Oxybeline. It is a representative of that now extinct stock from which have arisen the higher groups such as *Brimocelus* and *Belomicrus.*

Ethology.—The males as well as the female sex of *Belomicroides* are furnished with a psammophore. This is presumptive evidence that the members of this genus nest in dry, sandy or friable soil and excavate their burrows in a manner comparable to that of *Belomicrus.* The development in the female sex of a compressed and laminately keeled hypopygium, which is reminiscent of that of the Nyssonid *Metanysson,* is probably connected in some fashion with the biology of *Belomicroides.* Aside from these inferences, however, nothing is known of the ethology of these tiny forms.[13]

Component species.—Five forms of *Belomicroides* have been described. Of these, two—*Marleyi*[14] and *pictus*[15]—are South African, while the remaining three—*Schmiedeknechtii,*[16] *san-*

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[12] Occ. Pap. Rhodesian Mus., no. 5, p. 38, (1936).

[13] Bull. Soc. Hist. Nat. Afriq. Nord, XXII, p. 112, (1931); *v. et.* discussion of the biology of the genus *Belomicrus.*

[14] *B[elomicroides] Marleyi* Arnold, Ann. Transvaal Mus., XII, p. 58, (1927); [♀; Durban, Natal, South Africa].

[15] *B[elomicroides] pictus* Arnold, Ann. Transvaal Mus., XII, p. 56, figs. 1, 1a-b, (1927); [♂, ♀; South Africa, Cape of Good Hope: Willowmore; Ceres. Southern Rhodesia: Sawmills].

[16] *Belomicroides Schmiedeknechtii* Kohl, Ann. K. K. Naturhist. Hofmus., Wien, XIV, p. 313, pl. 19, fig. 9, (1899); [♀; Tunis]. *Belomicrus (Belomicroides) Schmiedeknechtii* Kohl, Konowia, II, p. 180, fig. 16, (1923).

tschii,[17] and *maurusius*[18]—are known from Algeria and Tunis. In 1931, I presented a key for the separation of these five species.[19]

Distribution.—The distribution of *Belomicroides,* as known at present, is discontinuous. The genus is wholly African. These rare and tiny xerothermal forms have been taken in the Cape region of South Africa and in Algeria and Tunisia in the western portion of the Eremian region of northern Africa. However, *Belomicroides* like *Belomicrus,* will probably be found rather widespread throughout the xeric areas of the East African and Sudanese provinces when the fauna of these regions is more intensively collected and studied.

BRIMOCELUS Arnold

Belomicrus (*Brimocelus*) Arnold, Ann. Transvaal Mus., XII, p. 62, (1927).—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

Brimocelus Pate, Mem. Amer. Ent. Soc., no. 9, p. 14, (1937).—Pate, Philippine Journ. Sci., LXIV, p. 376, (1938).

GENOTYPE: *Belomicrus* (*Brimocelus*) *radiatus* Arnold, 1927 [=*Brimocelus radiatus* (Arnold)]. (Monobasic and by original designation.)

The present genus is somewhat intermediate in character between *Belomicroides* and *Belomicrus,* agreeing with the former in the convex abdominal venter with the tergites folded under roundly to the sternites and in the lack of distinct lateral carinae on the propodeum, and with the latter in the possession of a distinct propodeal mucro and alate lateral expansions of the postscutellum. From both, *Brimocelus* may be distinguished by the pronotum which is sunken much below the level of the strongly arched mesonotum. The chief differential features separating *Brimocelus* from the other genera of the tribe have been presented in the foregoing key.

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[17] *Oxybelus* (*Belomicroides*) *santschii* Schulthess, Konowia, IV, p. 187, (1925); [♀; Hammamet, Tunisia]. *B*[*elomicrus*] (*Belomicroides*) *Santschii* Schulthess, Bull Soc. Hist. Nat. Afriq. Nord, XVII, p. 219, (1926).

[18] *B*[*elomicroides*] *maurusius* Pate, Bull. Soc. Hist. Nat. Afriq. Nord, XXII, p. 111, fig. 1 A, (1931); [♂; Biskra, Algeria].

[19] Bull. Soc. Hist. Nat. Afriq. Nord, XXII, p. 113, (1931).

Generic characters.—Small forms. Head suborbicular in anterior aspect, as long as broad; eyes elongate-oval, reaching to the bases of the mandibles, the malar space absent or reduced to a mere line, the inner orbits parallel to very slightly divergent above, all facets equal in female but more coarsely facetted on lower inner half in male; vertex with the ocellar area raised, the anterior ocellus situated in a small pit, otherwise simple; ocelli normal, situated in a low triangle or a curved line, the postocellar distance longer than the ocellocular line. Antennae short, thirteen-segmented in males, twelve-segmented in females, situated very low on face on dorsal margin of clypeus. Clypeus transverse, subtrigonal, flat laterally to tumid discally. Maxillary palpi six-segmented, labial four-segmented. Mandibles falcate, notched a little beyond the middle on inner margin; excised medially on lower outer margin.

Thorax with the pronotum transversely arcuate and situated much below the level of the mesonotum, the tubercles not attaining the tegulae. Mesonotum strongly arched and rounded and vertically declivous anteriorly to the level of the pronotum, evenly arcuate in dorsal aspect anteriorly; suture between mesonotum and scutellum distinct, deeply impressed and widened laterally; scutellum subrectangular, the hind angles dentate, the posterior margin convex; postscutellum subrectangular, transversely and strongly concave, the squamae absent but the lateral and posterior margins with strong reflexed laminate expansions of which the lateral margin is concavely arcuate, the hind angles acute, the posterior margin transverse, bisinuate, roundly notched medially and dentate on each side of the emargination Mesopleura with the episternal suture and the episternaulus present and deeply impressed. Propodeum with a distinct mucro but without well developed lateral carinae or a discal areole on posterior face.

Wings in general as in *Belomicrus.*

Legs with the middle and hind tibiae weakly spined on extensor surface; middle tibiae with one apical calcar. Fore tarsi of females furnished with an irregular series of long spines which do not form a distinct pecten.

Abdomen sessile, ovate; tergites not abruptly flexed under at the sides and forming a sharply margin there but folded under roundly to the venter and imbricate with the sternites which are convex; first tergite short, the anterior declivous portion strongly concave; males with a triangular pygidium.

Remarks.—Arnold originally proposed this entity as a subgenus of *Belomicrus*; but, although I have seen no material of the group, I do not believe it may be retained in that genus without doing violence to recognized generic concepts. The most distinctive and invariable feature of *Belomicrus* is the concave or relatively flat abdominal venter caused by the abrupt inflexion of the lateral portions of the tergites. According to Arnold, this is not the case in *Brimocelus,* and consequently I have ventured to accord the present entity full generic status.

The genus *Brimocelus* is related on the one hand to *Belomicroides* and on the other to *Belomicrus;* it represents an intermediate link in the generic evolution of the Oxybelini. The head, the propodeum and the abdomen of the present genus are basically very similar to those of *Belomicroides,* but the presence of a distinct mucro on the propodeum and the development on the lateral and posterior margins of the postscutellum of small laminate subalate expansions which may be interpreted as precursors of the squamae that are so characteristic of the genera *Belomicrus, Enchemicrum* and *Oxybelus* attest the affinity of *Brimocelus* to those genera. In all probability, *Brimocelus* arose from the same ancestral stock in which *Belomicroides* had its origin.

Distribution.—The genus *Brimocelus,* which contains merely the genotypic species *radiatus,*[20] is known at present only from the Cape region of South Africa.

BELOMICRUS A. Costa

Belomicrus A. Costa, Annu. Mus. Zool. R. Univ. Napoli, vi, p. 80, ([1866] 1871).—Gribodo, Boll. Soc. Ent. Ital., xvi, p. 280, (1884).—Kohl, Ann. K. K. Naturhist. Hofmus., Wien, xi, p. 472, (1896).—Kohl, Ann. K. K. Naturhist. Hofmus., Wien, xiv, p. 314, (1899).—Ashmead [in part], Canad. Entom., xxxi, p. 162, (1899).—Kohl, Zeitschr. f. Hymen. u. Dipt., v, p. 225, (1905).—Rohwer, Ent. News, xix, p. 417, (1908).—Rohwer & Cockerell, Ent. News, xix, p. 180, (1908).—Baker [in part], Pomona Coll. Journ. Ent., i, p. 28, (1909).—Morice, Trans. Ent. Soc. London, 1911, p. 133, (1911).—Kohl [in part], Konowia, ii, p. 7, (1923).—Carter, Canad. Entom., lvii, p. 131, (1925).—Berland, Faune de France, x, p. 211, (1925).—Arnold [in part], Ann. Transvaal Mus., xii, p. 60, (1927).—Maidl [in Schmiedeknecht], Hymen. N. u. M.-Europ., Zw. Aufl., p. 660, (1930).—Arnold [in part], Check-List Sphegid. Ethiop. Reg., p. 14, (1930).—Pate, Ent. News, xlii, p. 77, (1931).—Arnold [in part], Occ. Pap. Rhodesian Mus., no. 5, pp. 31, 38, (1936).—Williams, Pan-Pacific Ent., xii, p 3, (1936).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 12, (1937).—Pate, Philippine Journ. Sci., lxiv, pp. 375, 387, (1938).

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[20] *B[elomicrus]* (*Brimocelus*) *radiatus* Arnold, Ann. Transvaal Mus., xii, p. 62, figs. 2, 2 a-c, (1927); [♀, ♂; South Africa, Cape Province: Ceres; Montagu; Aliwal North].

Oxybeloides Radoszkowski [in Fedtsckenko], Reise in Turkestan, II, Sphegid., p. 68, (1877).—Kohl, Termeszetrajzi Fuzetek, VIII, p. 102, (1884).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 46, (1937).

Oxybelus Radoszkowski [in part], (in Fedstschenko), Reise in Turkestan, II, Sphegid., p. 70, (1877).—Kohl [in part], Termeszatrajzi Fuzetek, VIII, p. 112, (1884).—Robertson [in part], Trans. Amer. Ent. Soc., XVI, p. 77, (1889).—Radoszkowski, Bull. Soc. Nat. Moscou, (N.S.), V, p. 292, (1891).—Ashmead [in part], Colorado Biol. Asso., Bull. no. 1, p. 31, (1891).—Cockerell, Canad. Entom., XXVII, p. 309, (1895).—Dalla Torre [in part], Catal. Hymen., VIII, p. 637, (1897).—Cresson [in part], Mem. Amer. Ent. Soc., no. 5, p. 53, (1928).

Oxybelus (*Oxybeloides*) Kohl, Ann. K. K. Naturhist. Hofmus., Wien, VII, p. 205, (1892).—Kohl. Verh. Zool.-Bot. Ges., Wien, XLIII, p. 34, (1893).

Oxybelus (*Belomicrus*) Dalla Torre, Catal. Hymen., VIII, p. 638, (1897).

Oxybelomorpha Brauns [in Kohl], Ann. K. K. Naturhist. Hofmus., Wien, XI, p. 475, (1896).—Ashmead, Canad. Entom., XXXI, p. 160, (1899).—Baker, Pomona Coll. Journ. Ent., I, p. 28, (1909).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 46, (1937).

Belomicrus (*Oxybelomorpha*) Kohl, Konowia, II, p. 7, (1923).—Schulthess, Konowia, IV, p. 158, (1926).—Schulthess, Bull. Soc. Hist. Nat. Afriq. Nord, XVII, p. 219, (1926).—Arnold, Ann. Transvaal Mus., XII, p. 60, (1927).—Arnold, Ann. Transvaal Mus., XIII, p. 411, (1929).—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).—Pate, Bull Soc. Hist. Nat. Afriq. Nord, XXII, p. 113, (1931).—Arnold, Occ. Pap. Rhodesian Mus., no. 5, p. 30, (1936).—Pate. Mem. Amer. Soc., no. 9, p. 46, (1937).—Pate, Philippine Journ. Sci., LXIV, p. 376, (1938).

Belomicrus (*Oxybeloides*) Kohl, Konowia, II, p. 182, (1923) —Forsius, Notul. Entom., III, p. 65, (1923).—Merisuo, Notul. Entom., XIII, p. 72, (1933).

Belomicrus (*Nototis*) Arnold, Ann. Transvaal Mus., XII, p. 64, (1927).—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).—Arnold, Occ. Pap. Rhodesian Mus., no. 5, p. 32, (1936).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 43, (1937).—Pate, Philippine Journ. Sci, LXIV, p. 375, (1938).

Belomicrus (*Pseudoxybelus*) Gussakovskij, Trav. Inst. Zool. Acad. Sci. USSR, I, p. 266, (1933).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 56, (1937).—Pate, Philippine Journ. Sci., LXIV, p. 376, (1938).

GENOTYPE: [21] *Belomicrus italicus* A. Costa, 1871. (Monobasic.)

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[21] The types of *Oxybeloides* Radoszkowski, *Oxybelomorpha* Brauns, *Nototis* Arnold and *Pseudoxybelus* Gussakovskij are given in my paper on the generic names of the Sphecoid wasps [Mem. Amer. Ent. Soc., no. 9, (1937)]; and a discussion of each of these genotypic species will be found in the section devoted to Series and Species Groups of *Belomicrus* in the second paper of this general series.

Like the genus *Anacrabro,* the most distinctive character of *Belomicrus* is the flat or concave abdominal venter, caused by the abrupt and sharp inflexion of the lateral portions of the tergites. This feature differentiates *Belomicrus* from all the other members of the Oxybelini. Furthermore, from the two preceding genera, *Belomicroides* and *Brimocelus,* the present entity is distinguished by the well developed postscutellar squamae and propodeal mucro and the presence of distinct lateral propodeal carinae and a discal areole on the posterior face of the propodeum, agreeing in these particulars with the following two genera, *Enchemicrum* and *Oxybelus.* But these latter genera lack the psammophore that is so characteristic of the female sex of *Belomicrus;* moreover, in *Oxybelus* and *Enchemicrum,* the last tarsal segment is inflated while the marginal cell of the fore wing is usually more or less truncate apically and furnished with a distinct appendiculate cell, whereas the last tarsal segment of *Belomicrus* is simple and the marginal cell is acute apically with no appendiculate cell present, or if so, then it is very small and relatively inconspicuous. From *Oxybelus,* the present genus is still further distinguished by the more subtile puncturation and the lack of a vertical carina on the mesepisternum just before the middle coxae.

Generic characters.—Small forms. Head subquadrate to suborbicular in anterior aspect, transversely subrectangular in dorsal aspect. Eyes elongate-oval, more coarsely facetted anteriorly than posteriorly, reaching to the bases of the mandibles, inner orbits subparallel, arcuate, or somewhat divergent above. Vertex flat, not produced appreciably above the dorsal margins of the eyes. Ocelli normal, arranged in a very low triangle or a curved line, the postocellar distance usually twice or more the ocellocular line, an impressed furrow running obliquely forward from hind ocelli to dorsal margins of compound eyes usually present. Temples moderate to wide above, tapering ventrad, in females with a vertical row of long ammochaetae separating the temples from the post-temporal region. Malar space short, narrow, usually reduced to a mere line. Antennae simple, unmodified, always distinctly thirteen-segmented in males and twelve-segmented in females, situated low on face on dorsal margin of clypeus. Clypeus transverse, subfusiform, usually with a projecting median lobe which is variously modified. Labrum narrow, transverse, apical margin entire, arcuate; usually hidden beneath clypeus. Maxillary palpi six-segmented, labial four-segmented. Mandibles subfalcate; apex simple, acute to acuminate, inner margin variable, either simple and edentate, notched or toothed medially; lower margin provided with a row of long ammochaetae and varying from entire to strongly emarginate medially. Females with a distinct psammophore which is usually lacking in males.

Thorax relatively stout. Pronotum usually narrow, transverse, and not situated appreciably below level of mesonotum, the tubercles not attaining the tegulae. Mesonotum relatively flat, anteriorly usually with a fine double median longitudinal line; scutellum semi-circular, trapezoidal or subquadrate, carinate or not medially, and usually with narrow, translucent, laminate margins laterally; postscutellum trigonal, trapozoidal or transversely subrectangular, carinate or not medially, furnished laterally with variousy formed alate laminate expansions, the squamae. Mesopleura with or without an epicnemium anteriorly, the episternal suture passing vertically from below tegulae, hypersternauli distinct to obsolescent, discoposteriorly with a distinct small pit; mesepisternum without a vertical carina just before the middle coxae but with a small acute tooth just above them. Propodeum armed with a median dorsal, backward projecting, protean shaped process, the mucro; with well developed lateral carinae and posterior face with a well demarcated discal areole.

Fore and hind wings in general as described under tribal diagnosis; the marginal cell of fore wing acute at apex and without an appendiculate cell, or if such is present, then very small and inconspicuous; the transverse cubital vein of fore wing more or less vertical and the serial first recurrent-cubital vein either very faintly angulate or gently arcuate.

Legs with the femora fusiform, the hind pair often bowed and with the genicular area strongly keeled distally above; tibiae obterete, the middle and hind pair usually spinose on outer or extensor surface, middle tibiae with one apical calcar just before which is usually a longitudinal, often oblique, furrow or sulcus—the calcaral furrow; hind tibiae with two calcaria apically; tarsi simple, the last segment not inflated, the females with a distinct pecten on fore tarsi, the males frequently with rudiments of one discernible. Females with trochanteral and femoral, and often humeral and tibial also, ammochaetae present.

Abdomen sessile, oval; first five tergites in females and six in the males abruptly flexed under at the sides so that the ventral and dorsal portions form a sharp edge at their junction; sternites concave or relatively flat; females with a trigonal pygidium; males with a subquadrate or subrectangular pygidium when such is present; hypopygium of females simple.

A discussion of the taxonomy, ethology and distribution of *Belomicrus* will be given in the second paper of this general series. There follow herewith descriptions of the North American species.

DESCRIPTIONS OF THE NEARCTIC SPECIES [22]

Belomicrus apache [23] new species (Pl. I, fig. 17; pl. II, fig. 42.)

This and the following eleven forms comprise a distinct series of species groups differentiated from the other North American species, which constitute the Vierecki Series, by the possession of a number of common features. The most striking characteristic of the present or Forbesii Series is the trigonal postscutellum with the squamae subrectangular in shape and situated obliquely along the entire length of the posterior margin so that they are more or less contiguous behind. A discussion of the diagnostic features and the interrelationships of the groups of the Forbesii Series will be presented in the section dealing with the taxonomy of the genus *Belomicrus*.

The extraordinary ancoriform clypeal process, the well developed temporal region of the head, and the poorly developed squamae and mucro differentiate this peculiar and interesting little species from all other members of the genus in North America or, for that matter, the world in general.

Type.—♀; Las Cruces, Doña Ana County, New Mexico. Elevation, 3883 feet. (T. D. A. Cockerell; on *Opuntia.*) [Academy of Natural Sciences of Philadelphia, Type no. 10550.]

Female. 3 mm. long. Black; the following stramineous: mandibles except the rufous apices, pronotum medially on dorsal surface, prothoracic tubercles, scutellum with a small spot medio-posteriorly, postscutellum and squamae except for pellucid outer margins of latter, fore femora beneath and at apex, and middle and hind femora narrowly at apex, and all tibiae on extensor surface. Scape anteriorly, tegulae and axillary sclerites, testaceous. Clypeus including it process, scape posteriorly, pedicel, flagellum, trochanters, femora and flexor surfaces of tibiae, sordid fulvous. Mucro pellucid. Abdomen ferruginous. Wings clear hyaline, iridescent; stigma and veins fulvous.

Head fulgid; subquadrate in anterior aspect; subrectangular in dorsal aspect, five-sevenths as long as wide, the posterior margin broadly arcuately emarginate. Front laterally, and medially below, and clypeus entirely clothed with long dense appressed silvery pile; front medially and vertex sparsely and inconspicuously clothed with suberect subaeneous pubescence;

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[22] The proportional measurements given in the following descriptions have all been made under a magnification of 112X, by means of a linear and a Whipple ocular micrometer.

[23] After the Apache Indians of the southwestern United States.

temples with sparse silvery pubescence. Front, vertex and temples with a fine microscopic clathrate sculpture upon which is superposed an irregular scattered series of moderately close setigerous acupunctures; width of front at distal end of scape three-fifths the length of eye; from anterior ocellus with a faint median longitudinal sulcus upon each side of which the surface is gently swollen, the area along the inner orbits narrowly and shallowly concave. Vertex without tubercles behind the compound eye; ocelli moderate, situated in a curved line, postocellar line almost three times the length of the ocellocular line, an indistinct fossa laterad of each hind ocellus from the posterior lateral angles of which runs obliquely forward to the dorsal margin of each eye an indistinct arcuate sulcus. Temples very well developed, their postocular length one and one-half times the length of the scape, temporal carinae and ammochaetae wanting. Antennae short, reaching to or a little beyond the hind ocelli, situated low on face on dorsal margin of the clypeus twice as far from each other as from the nearest eye margin; scape straight, obterete, two-fifths the length of eye; pedicel subcylindrical, subequal in length to the first two flagellar articles combined; flagellum finely puberulent, inconspicuously incrassate distad, about twice as long as the scape, first two segments subequal in length and not rounded out beneath, last segment simple, terete, subequal in length to the two preceding article combined. Clypeus flat, transverse, narrow, linear, its length one-tenth that of eye, armed medially with a heavy projecting ancoriform process which from apex to the clypeofrontal suture is one-fifth that of eye, the width of the pedicel of the process one-tenth the length of the eye, the transverse width of expanded apex of the process three times the width of the pedicel at its narrowest point, the expanded apex of the process with a strong reflexed carinate rim subapically, medioapically below which is a small tubercle. Mandibles simple, falcate; the apex acute; inner margins with a low blunt obtuse tooth medially; lower margin simple, entire.

Thorax subfulgid; with a sparse decumbent silvery puberulent pubescence on the pronotal tubercles, the mesonotum, scutellum and mesopleura. Pronotum narrow, transverse, linear, with a fine microscopic clathrate sculpture; dorsal surface weakly notched medially; posterior margin slightly impressed; anterior dorsal margin with the lateral angles broadly rounded; anterior surface finely subfavose and irregularly longitudinally lineate. Mesonotum with an indistinct, obscure, very fine microscopic sculpture upon which is superposed a scattered series of setigerous acupunctures; scutellum and postscutellum sculptured like mesonotum, the scutellum very gently tumid discally and not longitudinally carinate medially, laterally with a very narrow laminate translucent reflexed margin; postscutellum flat, subtrigonal to subtrapezoidal, one-third the length of the scutellum. Squamae oblique, simple flat alate expansions of the subtrigonal postscutellum, subcontiguous behind, the apices subacute, the posterior emargination deep, U-shaped and one-third the length of the scutellum. Mucro short, straight, two-thirds the length of the scutellum, finely canaliculate above, apex entire, obtuse. Mesopleura flat, with a fine microscopic clathrate sculpture; prepectus rounded anteriorly, no epicnemium; episternal suture, hypersternaulus, and mesopleural pit distinct but not deeply impressed. Metapleura with surface sculpture similar to that of mesopleura. Propodeum subopaque, glabrous, finely favose on all faces; lateral carinae laminate, well developed for their entire length, weakly and inconspicuously forked below; discal areole of posterior face obcuneate, transversely substriate within.

Fore legs with the humeral, trochanteral, femoral and tibial ammochaetae wanting; the fore tarsi with a weak pecten; middle and hind tibiae spinose on outer posterior margins; hind femora weakly bowed, the genicular area carinate above but not fornicate.

Abdomen subfulgid; weakly constricted between the segments; sparsely clothed with decumbent silvery puberulent pubescence; covered with fine microscopic separated setigerous acupunctures; pygidium flat, trigonal, a little longer than wide at base, the disc with a few scattered setigerous punctures.

Male. Unknown

Remarks.—This curious little species, which is known only from the unique female described above from south-central New Mexico, is not obviously very closely related to any other known member of the genus in either the New or Old World faunae. Despite the unique and extraordinary clypeal process and the well developed temples, the habitus of *apache*, particularly the squamae which appear to be merely flat alate expansions of the lateral margins of the post-cutellum, is essentially that of a very generalized member of this genus.

Belomicrus vanyume[24] new species (Pl. I, fig. 5; pl. II, fig. 53.)

This large and handsome species is one of the most distinctive North American forms of *Belomicrus*. The strong translucent laminate margin of the prepectus, the dentate mesepisterna and the fenestrate squamae distinguish it from all other Nearctic species.

It is apparently most closely related to the nominate form of *forbesii*, but differs from that species in addition to the characters given above, in the flatter clypeal disc, the differently shaped fore femora, the red abdomen, the longer interantennal and postocellar lines, the longer scapes, and the appreciably wider front.

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[24] After the Vanyume Indians who formerly inhabited the Mohave Desert region of southern California.

Type. — ♀; Victorville, Mohave Desert, San Bernardino County, California. September 1, 1919. (Rehn & Hebard.) [Academy of Natural Sciences of Philadelphia, Type no. 10551.]

Female. 5.5 mm. long. Black; the following sulphureous: palpi, mandibles except for ferruginous apices; clypeal disc, scape, pedicel, flagellum beneath (sordid fulvous above), pronotum dorsally to and including the tubercles, axillary sclerites, a small spot laterally on each side of the mesonotum close to the tegulae, scutellum, postscutellum, groove of mucro, first three abdominal tergites with a broad preapical fascia and the last three tergites entirely, mesopleura with a spot dorsally below each anterior wing-base, femora apically, and all tibiae and tarsi entirely. The following fulvous: clypeal bevel, inner margins of mandibles, coxae, trochanters, and femora basally. Mucro and tegulae pellucid. Abdomen with first four tergites bright ferruginous basally, venter light fulvous. Wings clear hyaline, iridescent; veins fulvous.

Head orbicular in anterior aspect; front and clypeus clothed with appressed silvery silky pubescence; vertex with inconspicuous decumbent puberulent silvery pubescence; temples with fine appressed puberulent pubescence. Front with fine irregularly disposed close puncturation more or less obscured by the pile, width at distal end of scapes five-eights the length of the eyes; from anterior ocellus with a shallow impressed median longitidinal furrow, on each side of which the surface is gently tumid passing laterad into a broad shallow vertical trough which parallels the upper portions of the inner orbits. Vertex subfulgid, with very fine microscopic clathrate sculpture basically upon which is superposed a series of close but somewhat irregularly disposed fine punctures; no tubercle or callosity behind the compound eyes; ocelli arranged in a very low triangle, the postocellar line three times the length of the ocellocular, the ocelli large, the diameter of the hind ones subequal to the ocellocular line, from the outer postero-lateral angles of each hind ocellus runs obliquely forward to the dorsal margins of the eye a strong and deeply impressed oblique sulcus. Temples normal, moderate, subequal in length to the scape, temporal carinae absent, temporal ammochaetae present and well developed. Antennae short, reaching to or slightly beyond the hind ocelli, situated low on face on dorsal margin of clypeus almost twice as far from each other as from the nearest eye margin; scape straight, cylindrical to inconspicuously obterete, three-eighths the length of the eye; pedicel obterete, two-thirds the length of the first two flagellar articles combined; flagellum finely puberulent, stout, the segments broader than long except the ultimate one which is simple, terete, and a little longer than the two preceding articles combined. Clypeus transverse, subfusiform, flat; length medially one-fourth that of eye; produced medio-apically into short broad subrectangular lobe, the apical margin of which is gently convex and furnished with a narrow, linear, glabrous and nitidous bevel; the disc elevated into a flat subcampanulate platform which is slightly wider than long. Mandibles simple, stoutly falciform; apices acute; inner margins with a very small low blunt obtuse tooth medially; the lower margin simple, entire, furnished with long ammochaetae.

Thorax subfulgid; dorsally with short sparse suberect silvery puberulent pubescence, mesopleura with appressed silvery puberulent pile. Pronotum relatively glabrous; narrow, linear, with a very fine and inconspicuous microscopic clathrate sculpture upon which is surposed a scattered series of fine acupunctures; dorsal surface notched medially, anterior margin and lateral angles rounded and vertically declivous, medio-laterally on each side with a sharp carina descending vertically to neck; neck and anterior surface lineate. Mesonotum with the surface sculpture similar to that of the dorsal surface of pronotum but puncturation stronger, sparser, and more irregular and scattered; anteriorly without trace of a median line, lateromedially on each side with a short impressed line (trace of the parapsidal furrow); suture between mesonotum and scutellum distinctly impressed; scutellum flatly tumid, sculptured like mesonotum, not carinate medially, laterally with narrow laminate pellucid margins; postscutellum subtrigonal, one-third the length of the scutellum, subgibbous discally. Squamae oblique, subrectangular, contiguous behind and completely enclosing the postscutellum, the posterior emargination broadly V-shaped, surface flat with the outer margin pellucid and flaring up somewhat, medially with a pellucid fenestra on each side. Mucro short, straight, one-half the length of the scutellum, canaliculate above, apex obtuse acute. Mesopleura with sculpture similar to that of mesonotum but obscured by the pubescence; prepectus anteriorly with a strong translucent laminate margin which is continued ventrad on each side onto the mesepisterna and ends on each side of the mesosternum in a sharp acute caudally projecting tooth, behind this on each side is a ventrally directed blunt tooth; episternal suture impressed and consute, the hypersternaulus and mesopleural pit not very distinct. Metapleura glabrous, fulgid, horizontally striate. Propodeum subfulgid, glabrous; dorsal surface finely favose, anterior margin subfoveolate, lateral margins adjacent to the lateral carinae shallowly concave and with transverse oblique rugulae; posterior face finely favose, laterally on each side finely horizontally rugulose, discal areole obpyriform, nitidous within, acuminate ventrally, medio-dorsally with a carinula passing up to base of mucro; lateral carinae strong, laminate, translucent, well developed for their entire length; lateral faces very finely favose.

Fore femora subtriquetral, squarely and abruptly dilated at base and tapering thence toward apex; femoral ammochaetae present but poorly developed; fore tarsi with a well developed pecten; middle and hind tibiae strongly spinose on outer margin; hind femora distinctly bowed, the genicular area strongly carinate above but not fornicate. Fore wings with a strong spur of cubitus beyond the transverse cubital vein.

Abdomen fulgid; with fine rather sparse decumbent puberulent silvery pile above, sternites with a submarginal row of erect setulae; tergites with fine close acupuncturation; sternites subnitidous; pygidium trigonal, one and one-third times as long as broad at base, lateral margins slightly concavely arcuate, the disc flat and furnished with large coarse punctures.

Male. Unknown.

This striking, late aestival form of California's Mohave Desert is known only from the unique female described above.

Belomicrus forbesii (Robertson)

This and the following two North American species form a compact group of closely related forms differentiated from the other members of the Forbesii Series by the possession of a number of common features. These details will be presented in a following section devoted to a discussion of the taxonomy of the genus *Belomicrus.* At least two Old World species: *parvulus* and *antennalis,* are referable to the Forbesii Group of species; their closest affinities are with the typical race of *forbesii.*

The subemarginate character of the inferior mandibular margin and the angulate to subtuberculate postocular region of the head attest the close relationship of *forbesii* to *cookii,* from which the present species is most readily distinguished by the structure of the clypeus. In *cookii,* the apical margin of the median lobe is truncate with an abruptly inflexed bevel and cuspidate medioapically, whereas in *forbesii* this is convexly arcuate with a deflexed nitidous subbevelate area and at most merely angulate medially. Moreover, the postocular region of *forbesii* is subtuberculate at most; it never has the strong tuberculate process characteristic of *cookii.*

The present species breaks up into two geographic races, one of which is a montane form apparently confined to the Cascade and Sierra Nevada Ranges of California and southern Oregon, while the other is widespread from southern British Columbia, Alberta and Manitoba southward to central Oregon and Colorado. These races are differentiated and discussed separately below.

Belomicrus forbesii forbesii (Robertson)

(Pl. I, fig. 4; pl. II, figs. 54, 55.)

Oxybelus Forbesii Robertson, Trans. Amer. Ent. Soc., XVI, p. 85, (1889); [♂; Colorado].—Ashmead, Colorado Biol. Asso., Bull. no. 1, p. 31, (1890).—Dalla Torre, Catal. Hymen., VIII, p. 641, (1897).—Cresson, Mem. Amer. Ent. Soc., no. 5, p. 53, (1929); [♂; Colorado].

Oxybelus* (*Oxybeloides*) *columbianus Kohl, Ann. K. K. Naturhist. Hofmus., Wien, VII, p. 208, pl. XIII, figs. 11, 25, (1892); [BRITISH COLUMBIA: ♀, Revelstoke; ♂, Yale. WASHINGTON: ♀, Easton].

Oxybelus columbianus Dalla Torre, Catal. Hymen., VIII, p. 638, (1897).

Belomicrus forbesii Ashmead, Canad. Entom., XXXI, p. 162, (1899).—Baker, Pomona Coll. Journ. Ent., I, p. 30, (1909); [Denver, Colorado].—Kohl, Konowia, II, p. 273, (1923); [Colorado].—Carter, Canad. Entom., LVII, p. 131, (1925); [♂; Cypress Hills, Alberta].

Belomicrus columbianus Kohl, Konowia, II, p. 259, (1923); [♂, ♀; BRITISH COLUMBIA: Yale; Revelstoke. WASHINGTON: Easton].

Belomicrus larimerensis Rohwer, Ent. News, XIX, p. 417, (1908); [♀; Larimer County, Colorado; between 8000 and 9000 feet elevation].—Kohl, Konowia, II, p. 271, (1923).

The nominate race of *forbesii* is distinguished from the atypical subspecies chiefly by the structure of the mesothoracic epipleura. In *forbesii forbesii*, the epipleura, situated just below the anterior wing base, are simple and unmodified, whereas *forbesii penuti* is unique among all the North American species of *Belomicrus* in having developed on the mesothoracic epipleura a peculiar pocket-like structure or invagination which is open ventrally and directed dorsad. In addition, the typical subspecies of *forbesii* is a relatively fulgid form in comparison with *forbesii penuti* whose head, thorax, and in large measure the abdomen also, is very closely and finely punctate, thus rendering it more or less opaque. The livery of both subspecies is essentially the same.

Type.—♂; Colo[rado]. (No other data.[25]) [Academy of Natural Sciences of Philadelphia, Type no. 10022.]

Male. 5 mm. long. Black; the following stramineous: mandibles except for rufous apices, a transverse subapical fascia on the median lobe of clypeus, scape save for a small fuscous spot posteriorly, pedicel and flagellum beneath, pronotum to and including the tubercles, axillary sclerites, postscutellum, each abdominal tergite with a narrow transverse subapical fascia, fore femora apically and beneath, middle and hind femora annulate at apex, and all tibiae and tarsi entirely, the last somewhat fulvescent apically. The following badeous: apical margin of median lobe of clypeus, inflexed portions of tergites, and hypopygium. Pedicel and flagellum brunneous above; sternites light brunneous. Tegulae and squamae pellucid-hyaline. Wings clear hyaline, iridescent; stigma and veins fuscous.

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[25] This specimen may have been taken by James Ridings in the summer of 1864 in the mountainous region of Colorado. *Cf.*: Proc. Ent. Soc. Phila., IV, p. 242, (1865).

Head subquadrate, about as broad as long in anterior aspect; clypeus and lower half of front, except for glabrous antennal scrobes, clothed with an appressed silvery pile, vertex and upper half of front with short suberect inconspicuous puberulent pubescence, temples with sparse inconspicuous appressed silvery pubescence. Front flat, more or less fulgid, and save for nitidous antennal scrobes with moderately fine and close puncturation, the width at distal end of scapes about seven-tenths (.68) the vertical length of eyes. Vertex subfulgid, puncturation somewhat finer and closer than that of front, angulate to weakly subtuberculate behind each compound eye; ocelli large, situated in a curved line, the postocellar distance two and six-tenths the ocellocular line, from outer margin of posterior ocelli a weakly impressed subnitidous furrow runs obliquely forward to the dorsal margin of each eye. Temples moderate, normal, subfulgid, rather strongly and obliquely striato-punctate; temporal carinae wanting; post-temporal region fulgid, finely punctate with occasional striae. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus one and one-half times as far from each other as from nearest eye margin; scape straight, obterete, three-eighths the length of the eye; pedicel orcate, subequal in length to the first flagellar article; flagellum finely puberulent, first three segments slender, longer than broad, the first two articles subequal in length and rounded out beneath, the third segment shorter than the second, remaining segments thicker and broader than long except the ultimate article which is simple, terete and subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, flat laterally to distinctly tumid discally, length medially three-eighths that of eye; median lobe with apical width subequal to median length, each laterodistal corner sharply angulate, the apical margin gently arcuate to obtusely angulate medially and provided with a deflexed nitidous subbevelate area. Mandibles subfalcate, apices acute; inner margin with a blunt obtuse dentiform angle medially; lower margin subemarginate medially.

Thorax subfulgid; with short suberect inconspicuous puberulent pubescence which is light aeneous dorsally and silvery on pleura and venter. Pronotum with fine close puncturation, narrow, transverse, dorsal surface inconspicuously notched medially, posterior margin narrowly impressed, anterior dorsal margin and lateral angles rounded and the surface vertically declivous there. Mesonotum with fine close moderate puncturation, anterior third with a distinct fine double median longitudinal line; suture between mesonotum and scutellum impressed, simple; scutellum semicircular, flatly tumid, punctured like mesonotum, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, trigonal, more closely punctate than scutellum and one-half the length of it. Squamae flat, subrectangular, oblique in position, contiguous behind, traversed by fine subparallel carinulae, apices bluntly rounded, posterior emargination U-shaped. Mucro straight, linear, apex acutely rounded, subcanaliculate below, one-half the length of scutellum. Mesopleura with puncturation similar to that of mesonotum but prepectus with horizontal striae interspersed between punctures, rounded anteriorly and no epicnemium, episternal suture and mesopleural pit distinctly impressed, hypersternauli weak. Epipleura simple, without pocket. Metapleura glabrous, fulgid, horizontally striate. Propodeum glabrous, subfulgid; dorsal and posterior faces microscopically favose superposed on which are a series of oblique subparallel fine rugulae, discal areole of posterior face obpyriform, weakly demarcated and subnitidous within; lateral carinae well developed throughout entire length, sublaminate above; lateral faces fulgid, with fine microscopic clathrate lineations and horizontally striate above.

Fore coxae simple anteriorly, not sulcate; fore tarsi with a weak pecten. Middle and hind tibiae moderately spinose on extensor surface. Hind femora moderately bowed, the genicular area carinately keeled above and more or less fornicate there.

Abdomen subfulgid; not constricted between the segments; sparsely clothed with a decumbent silvery pile which is more evident on tergites than sternites. Tergites with a fine well separated acupuncturation; sternites more sparsely and finely punctate and more or less nitidous apically; ultimate tergite without a pygidial area and more coarsely and closely punctate than preceding tergite; hypopygium flat, glabrous, nitidous, discally with a puncture-like pit, apex truncate with the distolateral angles broadly rounded.

Allodigm.— ♀; Canyon of the Cache la Poudre, Larimer County, about twenty miles west of Fort Collins, Colorado. June 13, 1933. (V. S. L. Pate; on sand bank at edge of stream.) [Academy of Natural Sciences of Philadelphia.]

Female. 5 mm. long. Resembles the male (type) in all essential details of livery and structure except as follows:

Clypeus with no preapical stramineous fascia; abdomen with last segment more or less ferruginous and without stramineous maculation.

Head with front and vertex distinctly fulgid; the vertex weakly angulate behind the eyes, the oblique furrow from posterior ocelli more distinct than in male; temples more strongly striate; temporal ammochaetae present; post-temporal region nitidous. Antennae with first few flagellar articles simple, not rounded out beneath. Clypeus with disc glabrous, nitidous, the bevel of median lobe wider, the apical margin arcuate and scarcely angulate medially, laterally with a few clypeal ammochaetae. Mandibular ammochaetae very long and distinct.

Thorax and propodeum in general as in male but puncturation and sculpture somewhat finer and more subtile; the discal areole of posterior face of propodeum more or less obsolescent.

Legs generally the same as in male, but middle and hind tibiae more strongly spinose. Fore legs with humeral, trochanteral and femoral ammochaetae well developed; fore tarsi with a distinct pecten.

Abdomen as in male but more finely punctate; last tergite with a trigonal pygidium which is furnished with very coarse scattered punctures, the interpunctate areas nitidous; hypopygium with an elongate impunctate trigonal stripe medially.

Synonymical notes.—Through the courtesy of Dr. Franz Maidl, I have had an opportunity to study the British Columbia and Washington material upon which Kohl based his *Oxybelus* (*Oxybeloides*) *columbianus* and found that it is conspecific with Robertson's type of *forbesii,* as Kohl suggested in 1923 might be the case.[26] Rohwer's type of *Belomicrus larimerensis* is in the collection of the United States National Museum and upon examination has proven to be merely a melanic specimen of the typical subspecies of *forbesii.*

Variation.—The livery of *forbesii forbesii* is quite variable, ranging from well maculated forms such as Robertson's type of the species to melanic individuals like Rohwer's *larimerensis* or Kohl's *columbianus* which are practically, if not entirely, devoid of yellow markings. Furthermore, there is a distinct tendency toward progressive erythrization in the abdominal region; this is particularly noticeable in the female sex. The extent of the yellow maculations is probably correlated in some manner with the temperature and the relative humidity of the particular area or locality where the species occurs. Thus specimens from the warmer more xeric areas of Colorado, Idaho and central Oregon are furnished with a full livery, whereas material from the cooler more humid localities of British Columbia and Colorado is often distinctly melanistic; the types of *columbianus* and *larimerensis* are excellent examples of this latter phenomenon. The extent of the ferruginous coloring on the abdomen may be explained to a certain degree upon a similar basis. However, in this connection it is interesting to note that some years ago I took two female specimens of *forbesii forbesii* together in the net at the same time in the canyon of the Cache la Poudre in Colorado; the last abdominal segment only of one was red, whereas the other had the abdomen largely ferruginous. From this it might be inferred that the extent of the ferruginous markings may be almost an individual matter.

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[26] Konowia, II, p. 274, (1923).

Structurally this form displays a certain degree of plasticity in the postocular, flagellar and clypeal regions, and the genicular area of the hind femora. These variations are most noticeable in, and largely confined to the male sex; the females are a relatively conservative lot. The postocular angulation may be almost tuberculoid in character as in the specimens from North Dakota and Manitoba, the first few flagellar segments may show no sign of being rounded out beneath, the apical margin of the clypeal lobe may be distinctly angulate medio-apically and at times approaches the condition so characteristic of *cookii*, while the genicular area of the hind femora may be almost simple in character. But in each instance, there is every degree of gradation from an almost simple postocular region to a subtuberculate one, from more or less cylindrical basal flagellar articles to those well rounded out beneath, from a gently arcuate clypeal margin to one distinctly angulate medio-apically, from a relatively simply keeled hind femoral genicular area to one strongly fornicate. However, I have been unable to find any significant correlation between any two of these variations, or between them and the region from which the specimens that exhibit them came, except that material from the periphery of the range of *forbesii forbesii* shows a greater tendency to vary from the norm of the species than does that from nearer the epicenter of its distribution.

Specimens from the warmer arid areas are rather heavily clothed with silvery pubescence, particularly the males which in such cases usually have the terminal abdominal sternites, exclusive of the glabrous hypopygium, more or less villous. Conversely, material from the cooler more humid localities is furnished with a relatively thin and scant clothing of hair.

Specimens examined: 52; 28 males, 24 females, as follows:

MANITOBA: Brandon; July 11, 1916; (F. W. L Sladen); 1♂; [Can. Nat. Mus.].

ALBERTA: Bow Island; June 20, 1923; (H. E. Gray); 1♂; [Can. Nat. Mus.]. Cypress Hills; July 23; (E. H Strickland); 1♂. Edmonton; August 14, 1930; (O. Peck); 1♀; [Univ. Alta.].

BRITISH COLUMBIA: Revelstoke; 1891; 1♀; [*type* of *columbianus* Kohl; Vienna Mus.]. Yale; 1♂; [*allotype* of *columbianus*; Vienna Mus.]. Carbonate, Columbia River; elevation, 2600 feet; July 7-12, 1908; (J. C. Bradley); 2♂; [Cornell].

WASHINGTON: Easton, Kittitas County; elevation, 2168 feet; 1♀; [*paratype* of *columbianus*; Vienna Mus.]. Medical Lake, Spokane County; July 14, 1920; (R. C. Shannon); 1♂; [Wash. St. Coll.]. Lind Lake, [Adams County?]; May 20, 1919; (F. W. Carlson); 1♀; [Wash. St. Coll.]. Walla Walla, Walla Walla County; July 1936; (G. E. Bohart); 1♂; [Bohart].

OREGON: Anthony to Crawfish Lake, Blue Mountains, Umatilla County; elevation, 7100 to 7700 feet; August 5, 1929; (H. E. Scullen; on *Eriogonum flavum*); 1♂; [Oregon]. Lick Creek Reservation, Wallowa National Forest; elevation, 4600 feet; August 16, 1937; (Bollinger & Jewett); 1♀; [Ferguson]. Union, Union County; elevation, 2716 feet; June 11, 1926; (H. E. Scullen); 2♂, 1♀; [Oregon]. Keerin's Ranch, Izee, Grant County; June 25, 1935; (Joe Schuh); 1♂; [Ferguson]. Seneca, Grant County; July 11, 1935; (Joe Schuh); 1♀; [Ferguson]. Summit Prairie; August 3, 1935; (Joe Schuh); 1♀; [Ferguson]. Burns, Harney County; elevation, 4150 feet; July 2, 1927; (H. E. Scullen); 1♂, 1♀; [Oregon].

IDAHO: Warren, Idaho County; August 19, 1920; (J. Bequaert); 1♀. Ashton, Fremont County; elevation, 5250 feet; July 11, 1920; (F. E. Lutz); 1♀. Paris, Bear Lake County; elevation, 6000 feet; June 8, 1920; (F. E. Lutz); 1♂. Giveout (*ca.* 42° 24′ N., 111° 10′ W.), Bear Lake County; elevation, 6700 feet; July 7, 1920; (F. E. Lutz); 2♂, 1♀. [All Amer. Mus. Nat. Hist.].

MONTANA: Saltese, Mineral County; August 22, 1916; (A. L. Melander); 1♀; [Wash. St. Coll.].

WYOMING: Yellowstone National Park; July 31, 1930; 2♀; [A.M.N.H.]. Jackson, Teton County; elevation, 6300 feet; July 13-17, 1920; (F. E. Lutz); 2♂, 1♀; [A.M.N.H.]: July 22, 1926; (R. W. Haegele); 1♂.

COLORADO: Canyon of the Cache la Poudre, about twenty miles west of Fort Collins, Larimer County; June 13, 1933; (V. S. L. Pate; on sand bank at edge of stream); 2♀, 2♂. Larimer County; elevation between 8000 and 9000 feet; July 18; (C. P. Gillette); 1♀; [*type of larimerensis* Rohwer; U.S.N.M.]. Boulder County; July 25, 1925; (C. P. Custer); 1♀. Colo[rado]; (no other data); 3♂, 1♀; [including *type* of *forbesii;* A.N.S.P.]: 4♂, 4♀; [U.S.N.M.].

NORTH DAKOTA: Towner, McHenry County; June 23, 1933; (N. A. Weber); 1♂; [Dow].

Distribution.—The nominate race of *forbesii* is a vagile, eurythermal, aestival form widely distributed throughout the Sonoran and Transitions zones of the northwestern United States and the southern portions of the western Canadian provinces. The range of *forbesii forbesii* extends from the northern Great Plains region of central North Dakota and southern Manitoba westward into the foothills of the Rockies of central Colorado and southern Alberta; crossing the continental divide, it passes into the Wyoming basin and the Columbian plateaux of Idaho, Oregon and Washington, where it is widespread. By following up the course of the Columbia River and its tributary streams, the typical race of *forbesii* ranges as far north in British Columbia as the fifty-second parallel in the foothills of the Selkirk Mountains. Although *forbesii forbesii* is typical a Sonoran form in the western United States, it often invades the Transition zone and has been taken at altitudes of between 8000 and 9000 feet in the Rockies of northern Colorado and as high as 7500 feet in the Blue Mountains of northern Oregon. In Canada, however, it appears to be largely an inhabitant of the Transition zone in British Columbia and Alberta, ranging in the latter province from the southeastern Cypress Hills section well into the Canadian zone[27] in the vicinity of Edmonton.

In the Cascade Ranges of southern Oregon and the Sierra Nevada Mountains of northern and central California, the typical subspecies of *forbesii* is replaced by an interesting and distinctive peripheral montane race, *forbesii penuti.*

Belomicrus forbesii penuti[28] new subspecies

The differential features separating this geographic race from the nominate subspecies have been presented on a foregoing page in the introductory discussion of the typical *forbesii.*

Type.—♂; Yosemite Valley, Yosemite National Park, Mariposa County, California. June 28, 1926. (P. H. Timberlake; on *Eriogonum nudum* [Tibinagua].) [Academy of Natural Sciences of Philadelphia, Type no. 10552.]

Male. 5.5 mm. long. The following description is largely comparative with that of the preceding typical (or nominate) form of *forbesii,* and stresses solely those characters showing sufficient difference worthy of being noted.

Livery in general the same as *forbesii,* but scape largely dark, the pedicel and flagellum fulvous beneath; the last abdominal segment largely ferrugineous and the sternites brunneous; tarsi fulvescent.

Head opaque, the front and vertex with fine close contiguous puncturation; temples finely, closely, strongly obliquely striato-punctate; post-temporal region nitidous. Antennae with basal flagellar articles weakly rounded out beneath. Clypeus very strongly tumid discally, the apical margin of the median lobe distinctly angulate medially.

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[27] *Cf.* Strickland: Canad. Journ. Sci., D, XVI, pp. 178-181, (1938).

[28] After the Penutian linguistic family of Indian tribes that inhabit central California.

Thorax opaque, with fine close contiguous puncturation throughout. Mesothoracic epipleura with a pocket-like structure or invagination which is directed dorsad and open ventrally. Propodeum more subtilely sculptured than typical form, but discal areole of posterior face obtrigonal, nitidous within, and well demarcated; lateral carina very well developed for entire length.

Hind femora rather strongly bowed, the genicular area with a laminate keel distally above and strongly fornicate.

Abdomen subopaque to subfulgid, with rather close and fine acupuncturation on tergites, the sternites subnitidous. Penult and antepenult sternites and the inflexed portions of corresponding tergites distinctly villous.

Allotype.—♀; Huckleberry Meadow, Giant Forest, Sequoia National Park, Tulare County, California. September 5, 1932. (P. H. Timberlake; on *Oxypolis occidentalis.*) [Timberlake.]

Female. 5.5 mm. long. The following features are solely those noteworthy of difference from the ones given in the foregoing description of the male (type).

Head with the antennae and clypeus entirely black. Thorax with the transverse dorsal fascia on pronotum to the tubercles broadly interrupted laterally at each humeral angle. Femora black; tibiae stramineous on extensor surface only; tarsi brunneous. First five abdominal tergites furnished with narrow linear subapical fasciae which are narrowly interrupted medially; last segment black.

Head with the basal flagellar articles not rounded out beneath; apical margin of clypeus evenly arcuate; postocular angulation very weak.

Psammophore with mandibular, temporal, humèral, trochanteral and femoral ammochaetae present and well developed.

Discal areole of posterior face of propodeum obsolescent.

Fore tarsi with a distinct pecten.

Abdomen with last tergite furnished with a trigonal pygidium, the disc of which is nitidous between the sparse, coarse and scattered punctures; sternites subnitidous and more or less glabrous.

Paratypes.—5; 3 males, 2 females, as follows:

CALIFORNIA: Yosemite Valley, Yosemite National Park, Mariposa County; June 28, 1926; (P. H. Timberlake; on *Eriogonum nudum* [Tibinagua]); 1 ♂; [Timberlake].

OREGON: Lake of the Woods, Rogue River National Forest, Klamath County; elevation, 4950 feet; August 13, 1935; (George R. Ferguson); 1 ♀; [Ferguson]. Crater Lake National Park near headquarters, Klamath County; elevation, 64-6600 feet;

August 4, 1930; (H. A. Scullen); 2 ♂; elevation, 6600 feet; July 30, 1930; (F. Lyle Wynd); 1 ♀; [Oregon].

Variation.—The paratypic specimens from the Yosemite and the Lake of the Woods agree with the types in all essential particulars of livery and structure. The material from Crater Lake, however, is inclined to be melanistic, especially with regard to the yellow abdominal fasciae which are either greatly reduced or absent. Moreover, in the female from Crater Lake, the epipleural pocket although distinct is nevertheless not as well developed as in the material from the Lake of the Woods, the Yosemite and Sequoia National Park. Otherwise, however, these northernmost specimens agree with the types in all pertinent structural details.

Remarks.—The most distinctive diagnostic feature of *penuti* is the peculiar epipleural "pocket". This has probably resulted from a proliferation of an auriculate carinule on the mesothoracic epipleura, for rudiments of such a carina are barely discernible in some material of the typical race of *forbesii* from central and northern Oregon. Specimens from the more northern and eastern reaches of the range of *forbesii forbesii* have the epipleura simple, devoid of any such carina, or an occasional individual specimen may show merely the faintest traces of it.

Distribution.—This atypical race of *forbesii* is a montane, aestival form, confined apparently to the Cascade and Sierra Nevada Ranges of central and northern California and southern Oregon.

Belomicrus cookii Baker (Pl. I, fig. 3; pl. II, figs. 30, 31.)

Belomicrus Cookii Baker, Pomona Coll. Journ. Ent., I, p. 29, (1909); [♂, ♀; Claremont, California].—Kohl, Konowia, II, p. 272, (1923).

Closely resembling *forbesii* in its general habitus, *cookii* is distinguished from that species by the distinctly and strongly tuberculate character of the postocular region and the structure of the clypeus which has the apical margin of the median lobe truncate and cuspidate medio-apically. In addition, the hind femora of the present species are more strongly bowed with the genicular area as a rule more strongly keeled and fornicate than in *forbesii* in which the temples are punctatostriate throughout, the propodeum more coarsely lineate with the discal areole of the posterior face more or less opaque and microscopically subfavose within, while the mucro is acuminate and the longitudinal welts on each side of the median line of the second abdominal sternite are rather poorly developed. In *cookii*, the temples are simply striate at least on the lower two-thirds, the propodeum more delicately sculptured with the discal areole of the posterior face nitidous within, and the longitudinal welts of the second abdominal sternite are quite well developed, while the mucro is widened, more or less spatuloid and subtruncate apically, agreeing in this last feature with *coloratus* from which it may be separated by the character of the postocular region and the apical margin of the median lobe of the clypeus. The present species is, in all probability, a derivative of the typical stock of *forbesii*.

Baker originally described *cookii* from an indeterminate number of specimens of both sexes. A male is designated here as the lectotype.

Lectotype.—♂; Claremont, Los Angeles County, California. "April." (C. F. Baker.) [Pomona College.]

Male. 4.75 mm. long. Black; the following stramineous: mandibles except for the ferruginous apices, palpi, clypeus with a transverse band along the apical margin of the median lobe, scapes, pedicel, flagellum beneath, pronotum dorsally, pronotal tubercles, axillary sclerites, postscutellum, fore femora beneath and at apex and middle and hind femora apically, all tibiae and tarsi entirely and first five abdominal tergites with a narrow, transverse subapical fascia. Clypeus with the median lobe testaceous subapically; flagellum above and femora exclusive of the yellow maculation, brunneous. Last two abdominal segments brownish-ferruginous; tarsi fulvescent distally; tegulae and squamae pellucid-hyaline. Wings clear hyaline, iridescent; stigma and veins brunneous.

Head subquadrate, four-fifths as long as wide in anterior aspect; front save for the glabrous antennal scrobes, and clypeus with the exception of the disc, and the apical portion of the median lobe, clothed with dense appressed silvery pile. Vertex relatively glabrous; temples with fine appressed silvery puberulent pubescence. Front save for the nitidous scrobes with fine close puncturation obscured by the silvery pile, width at distal end of scapes a little less than two-thirds (.643) the vertical length of the eye. Vertex subopaque, with fine close puncturation and behind each compound eye with an acute transverse tuberculoid protuberance; ocelli large, situated in a curved line, the postocellar distance two and one-half times the length of the ocellocular line, from outer margin of each hind ocellus an indistinct arcuate nitidous groove runs obliquely forward to the dorsal margin of eye; vertex impressed immediately before the median ocellus. Temples normal, moderate, fulgid, striatopunctate above to obliquely striate below; temporal carinae wanting; post-temporal region largely nitidous. Antennae short, reaching about to occiput, situated low on face, two-thirds as far from the nearest eye margin as from each other; scapes straight, obterete, short, three-eighths the vertical length of the eye; pedicel narrowed basally, almost as wide as long, eight-tenths the length of the first flagellar article; flagellum finely puberulent, first segment almost twice as long as wide and strongly rounded out beneath, second segment longer than wide, eight-tenths the length of the first and rounded out beneath but not as markedly so as the first, third segment about as long as wide and very gently rounded out beneath, remaining articles except the last wider than long and not rounded out beneath, ultimate article simple, terete, subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, flat laterally to very strongly tumid discally, length medially about one-third that of eye, produced medially into a short broad subtruncate lobe, the apical width of which is about one-third the length of the eye, and the apical margin of which is provided with a glabrous, nitidous, more or less inflexed narrow bevel and armed medio-apically with mucronate tooth, the lateral angles dentiform. Mandibles falcate, the apices acuminate; lower margins with an inconspicuous notch or excision at basal third and provided with long ammochaetae; inner margins with an obtuse tooth medially.

Thorax subopaque; with puberulent whitish pubescence which is short, inconspicuous and suberect dorsally, and silvery, appressed and more noticeable on mesopleura and venter. Pronotum narrow, linear, transverse, with fine close acupuncturation, not appreciably notched medio-dorsally, the posterior margin strongly impressed, anterior dorsal margin and lateral angles broadly rounded and vertically declivous anteriorly. Mesonotum with moderate, fine, rather close puncturation, anterior fifth with a distinct fine double median longitudinal line; suture between mesonotum and scutellum simple, moderately impressed; scutellum subsemicircular, flat to gently tumid, punctured like mesonotum, not carinate medially, laterally with strong translucent laminate margins; postscutellum flat, trigonal, about two-fifths the length of the scutellum. Squamae subrectangular, oblique in position, transversed by fine subparallel carinulae, contiguous behind, the apices narrowly rounded, the posterior emargination acutely V-shaped. Mucro straight, short, about two-fifths the length of the scutellum, canaliculate beneath but not above, incrassate distad and subtruncate apically. Mesopleura striatopunctate on prepectus and above, remainder with moderate fine close puncturation, rounded anteriorly and without a trace of an epicnemium, episternal suture and mesopleural pit moderately impressed, hypersternaulus evident for a short distance anteriorly but becoming rapidly obsolescent caudad; epipleura simple. Metapleura glabrous, fulgid, horizontally striate. Propodeum glabrous; dorsal and posterior faces subfulgid, finely favose and more or less obscurely and confusedly transversely lineate, the latter with a concave nitidous obpyriform areole discally; lateral carinae well developed for their entire length, laminate above, simple below; lateral faces subnitidous discally, microscopically subfavose marginally.

Fore coxae simple, not sulcate anteriorly; fore tarsi with a short inconspicuous pecten. Middle and hind tibiae strongly spinose on outer margins. Hind femora strongly bowed, the genicular arc with a sharp carinate keel which is rather strongly fornicate apically.

Abdomen subfulgid; rather heavily clothed with a decumbent silvery pubescence dorsally, more sparsely so on venter. Tergites with fine close puncturation; sternites fulgid, with sparse fine scattered acupunctures; second sternite with an elongate longitudinal welt on each side of the median line; last tergite without a pygidial area and somewhat more coarsely punctate than the preceding tergite; penult sternite with a sharp arcuate welt laterally on each side; hypopygium flat, glabrous, nitidous throughout, apex subquadrately rounded.

Allotype.— ♀ ; Topotypical; same data as type.

Female. 4.5 mm. long. Coloration in general the same as male, but median lobe of clypeus is badeous apically; scape badeous medially, pedicel and flagellum croceous beneath, light fuscous above; abdomen with last four segments more or less ferruginous.

Head with the front fulgid and almost glabrous except below which together with the clypeus is clothed with appressed silvery pile. Temples strongly and obliquely striate and with a few punctures interspersed among the striae above; temporal ammochaetae present; post-temporal region glabrous and nitidous. Clypeus with the disc very strongly tumid, glabrous and nitidous; the apical margin of the median lobe with a wider bevel than in male and which is shallowly concave with an acute dentiform process medio-apically. Antennae as in male but pedicel is more cylindrical, about as long as wide and subequal in length to the first flagellar article; flagellum with the first two segments longer than wide, the first a little longer than the second, neither rounded out beneath, remaining articles, except the last, as wide as or wider than long. Mandibles with long ammochaetae on ventral margin. Otherwise as in male.

Thorax in general similar to the male.

Fore legs with the femora somewhat dilated basally; the metatarsi with a distinct pecten; humeral, trochanteral and femoral arrochaetae present. Legs otherwise as in male.

Abdomen like that of male but ultimate tergite furnished with a subequilaterally triangular pygidial area, the apex of which is narrowly rounded and the disc perfulgid and with scattered coarse well separated punctures between which the surface is nitidous; second and penult sternites without lateral welts.

Variation.—The series of specimens of this species before me shows little variation except that the yellow livery may be more or less extensive and the ferruginous color of the abdomen more or less marked than given in the foregoing descriptions.

Specimens examined: 10; 6 males, 4 females.

CALIFORNIA: Claremont, Los Angeles County; (C. F. Baker; Metz); [Pomona; Timberlake; Cornell; American Museum of Natural History.]

Distribution.—This vernal form, which according to Baker is common at Claremont during the month of April, is apparently confined to the southern piedmont of the Transverse Ranges district[29] of Los Angeles and adjacent counties in southern California. The present species will probably eventually be found to have at least as extensive a distribution as the typical race of *serrano*. All the material of *cookii* I have examined is topotypical.

Belomicrus coloratus Baker (Pl. I, fig. 2; pl. II, fig. 29.)

Belomicrus colorata Baker, Pomona Coll. Journ. Ent., I, p. 29, (1909); [♀; Ormsby County, Nevada].
Belomicrus colorato Kohl, Konowia, II, p. 273, (1923).

The present species agrees with *cookii* in having the mucro incrassate distad and canaliculate below, but is distinguished from that form in lacking any trace of postocular armature and in having the median lobe of the clypeus convexly arcuate and furnished with a glabrous, nitidous, deflexed subbevelate area distally, thus attesting its close affinity to *forbesii* of which it is in all probability a derivative. From *cookii* and *forbesii*, in addition to the features which may be inferred from the foregoing statement, *coloratus*, known as yet only from the female sex, may be readily separated by the wholly ferruginous abdomen and the opaque pygidial area. Furthermore, in *coloratus* the postocellar line and the scapes are somewhat longer while the front is appreciably broader than in either *forbesii* or *cookii*.

Type.—♀; Ormsby County, Nevada. (No other data.) [Pomona College.]

Female. 5 mm. long. Black; the following stramineous: mandibles except the rufous apices, scape narrowly at apex, pedicel beneath, pronotum dorsally to and including the tubercles, axillary sclerites, postscutellum, first five abdominal tergites with a narrow transverse preapical fascia, fore femora apically and beneath, middle and hind femora narrowly annulate at apex, fore tibiae entirely and middle and hind tibiae on extensor surface. Pedicel and scape fuscous above, luteous beneath. Median lobe of clypeus castaneous discally and apically. Tarsi and flexor surface of middle and hind tibiae fulvous. Tegulae light fulvous-pellucid; squamae and mucro hyaline-pellucid. Abdomen bright ferruginous. Wings clear hyaline, iridescent; stigma and veins dark fulvous.

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[29] *Cf.* footnote 34 under *Belomicrus serrano serrano*.

Head opaque, subquadrate, a little broader than long in anterior aspect; front laterad of the glabrous antennal scrobes, and clypeus except for the glabrous disc and apical margin of the median lobe, clothed with dense appressed silvery pile; front medially and above more sparsely and inconspicuously clothed with short suberect light puberulent pubescence becoming sparser and subaeneous on vertex; temples with an inconspicuous appressed silvery puberulent pubescence. Front flat and without an impressed median longitudinal line from anterior ocellus, with fine close punctuation throughout except for the flat nitidous antennal scrobes, width at distal end of scapes two-thirds the vertical length of eye. Vertex with very fine close puncturation becoming striatopunctate laterally, not tuberculate nor angulate behind the compound eyes; ocelli large, situated in a very low triangle, the postocellar distance two and three-fourths the length of the ocellocular line, from outer posterior angles of hind ocelli a straight impressed furrow runs obliquely forward to the dorsal margin of the compound eye. Temples normal, moderate, obliquely striatopunctate; temporal carinae wanting; temporal ammochaetae present; post-temporal region glabrous, nitidous, laevigate. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus one and one-half times as far from each other as from the nearest eye margin; scapes straight, obterete, four-tenths the length of the eye; pedicel obterete, longer than broad, one and one-fourth times the length of the first flagellar article; flagellum finely puberulent, first two segments longer than broad and subequal in length, each eight-tenths the length of the pedicel, neither rounded out beneath, remaining segments except last as broad as or broader than long, the ultimate article simple, terete, subequal in length to the two preceding segments. Clypeus transverse, flat laterally to strongly tumid discally where it is glabrous and nitidous, length medially about three-eighths the length of the eye, produced medioapically into a short projecting glabrous nitidous median lobe whose apical width is about three-tenths (.3125) the length of the eye, and the apical margin of which is gently arcuate and provided subapically with a broad transverse subbevelate area. Mandibles falcate, apices acute; lower margin simple, entire and provided with long ammochaetae; inner margins with a small obtuse tooth medially.

Thorax subfulgid; clothed with short suberect inconspicuous light aeneous puberulent pubescence dorsally, the mesopleura and venter with sparse appressed silvery pubescence. Pronotum narrow, linear, transverse, with fine close acupuncturation, not appreciably notched medio-dorsally, posterior margin impressed, anterior dorsal margin and lateral angles rounded and vertically declivous anteriorly where the surface is longitudinally lineate. Mesonotum with fine close puncturation, anterior third with a fine median longitudinal double line; suture between mesonotum and scutellum simple, impressed; scutellum punctured like mesonotum, flat to gently tumid, subsemicircular to subtrapezoidal and twice as long as wide basally, the hind corners weakly subangulate, lateral and posterior margins except medially edged with a narrow laminate translucent margin; postscutellum flat, subobcaliciform, one-half the length of the scutellum. Squamae oblique in position, contiguous behind, subrectangular, traversed by fine oblique subparallel carinulae, apices narrowly rounded, the posterior emargination somewhat U-shaped with the depth about one-sixth the length of the scutellum. Mucro short, one-third the length of the scutellum, straight, narrow, canaliculate beneath, slightly incrassate distad to the subobhastate apex. Mesopleura and prepectus rounded anteriorly, no epicnemium present, prepectus obliquely striatopunctate, the mesopleura almost horizontally striatopunctate, episternal suture and mesopleural pit distinct and impressed, hypersternaulus obsolescent. Metapleura fulgid, glabrous, very finely horizontally striate. Propodeum glabrous, subfulgid; dorsal and posterior faces microscopically favose and traversed by fine oblique lineations, discal areole of posterior face broadly obconical concave and nitidous within; lateral carinae well developed, sublaminate above, becoming rather abruptly obsolescent ventrally in the valvular region; lateral faces finely favose.

Fore legs with the humeral, trochanteral and femoral ammochaetae well developed; metatarsi with a distinct pecten. Middle and hind tibiae strongly spinose on outer posterior margins. Hind femora with dorsal surface strongly sinuate, the genicular area with a strong carinate keel which is distinctly fornicate apically.

Abdomen fulgid; the tergites clothed with a sparse decumbent silvery sericeous pile and with a fine rather close puncturation; ultimate tergite with a triangular pygidial area which is two-thirds as long as broad at base, the apex narrowly rounded, the disc more or less opaque and furnished with a fine microscopic reticulate sculpture upon which is superposed a series of large coarse scattered punctures. Sternites subnitidous and glabrous save for a transverse subapical row of rather large setigerous punctures on each segment.

Male. Unknown.

Remarks.—With the accession of more material, particularly of the male sex, this poorly known species may eventually prove to be merely a Great Basin race of the common widespread northern form *forbesii.* However, it seems best to regard *color-*

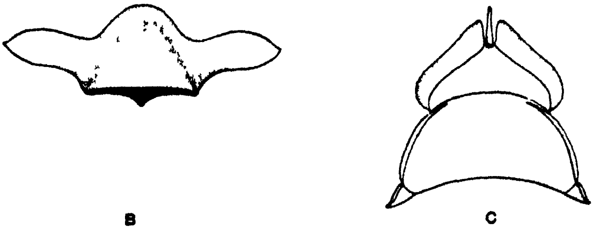
atus as a discrete form here, in view of the number of features, given in the foregoing introductory discussion and description of this species, wherein it differs from *forbesii*.

Specimens examined: 3 females, as follows:
NEVADA: Ormsby County; 1♀; [*type*; Pomona College].
IDAHO: Adelaide, Minidoka County; (on *S*[?] *filipes*); June 22, 1927; 2♀; [United States National Museum].

Distribution.—Despite its relatively large size and brilliant, striking coloration, the distributional data on the present species is very meagre. Apparently *coloratus* is a xerothermal aestival form of the Great Basin region, ranging throughout the intermontane plateaus from the western margin of the Nevada basin (Ormsby County) northward into the lava plateaus of southern Idaho's Snake River Plains (Minidoka County).

Belomicrus querecho * new species (Text-fig. 1.)

The superficial habits of *querecho* is very similar to that of the following Salton Sink species *cahuilla* with which it agrees in the emarginate character of the lower mandibular margin. From that form, however, *querecho* may be distinguished by the simple hypopygium, the coarsely punctate abdominal venter, the more distinctly demarcated pygidial area, the reticulate sculpture of the propodeum, the much shorter postocellar distance, the tuberculate postocular region, and the apparently tridentate clypeal lobe. In the last three details and in the interantennal-antennocular ratio, *querecho* closely resembles the foregoing



Text-fig. 1.—*Belomicrus querecho* new species. Male (*type*). Alamogordo, Otero County, New Mexico. A, structure of clypeus; B, ventral aspect of mandible; C, scutellum, postscutellum, squamae and mucro. (All figures greatly enlarged.)

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* Querecho: the old Pueblo name for the Mescalero Apache Indians of the southwestern United States.

southern Californian species *cookii*, but the emarginate mandibles and the presence of a distinct and well developed pygidial area as well as various other characters given in the following description immediately separate the present species from that form. The vitreous hyaline, practically ecarinulate squamae are quite unlike those of any other known Nearctic species of *Belomicrus*, although this feature is characteristic of a number of Old World forms, notably *ferrieri*, *modestus* and *obscurus*. The closest affinities of the present species are probably with the latter two Mediterranean and Eremian forms.

Type.—♂ ; Alamogordo, Otero County, New Mexico. Elevation, 4350-4600 feet. April 17, 1902. (Henry L. Viereck). [Academy of Natural Sciences of Philadelphia, Type no. 10570.]

Male. 3.75 mm. long. Black; the following stramineous: mandibles except rufous apices, pronotum dorsally to and including the tubercles, outer margins of axillary sclerites, postscutellum, fore and middle femora narrowly at apex, all tibiae on outer flexor surface, and all metatarsi. Antennae fulvous, the flagellum infuscated above; four distal tarsal segments sordid fulvous. Tegulae clear hyaline tinged with fulvous; axillary sclerites fulvous discally. Squamae vitreous hyaline; mucro pellucid. First two abdominal tergites ferruginous, the remainder very dark castaneous; venter black. Wings clear hyaline, iridescent; veins and stigma light brunneous.

Head suborbicular, somewhat broader than long in anterior aspect; front and clypeus, except for the distal margin of the median lobe of latter, clothed with appressed silvery pubescence; vertex and temples with sparser and shorter puberulent pubescence. Front flat, width at distal end of scapes about five-eighths (.643) the vertical length of eye, fulgid and with separated moderate puncturation more or less obscured by the silvery pile, no median longitudinal line or furrow from anterior ocellus. Vertex fulgid, with finer closer puncturation than front and tending to become transversely striatopunctate in occipital region; behind eye compound eye with an acutely angulate tuberculoid protuberance which is striatopunctate; ocelli large, situated in a curved line, the postocellar line two and one-half times the ocellocular distance, with a shallow subnitidous impression running obliquely forward from the hind margins of the posterior ocelli to upper inner orbits. Temples more or less diagonally striatopunctate; temporal carinae wanting; post-temporal region fulgid, subnitidous. Antenna short, reaching about to occiput, situated low on face on dorsal margin of clypeus, one and one-half times as far from each other as from nearest eye margin; scape straight, obterete, about one-third (.35)· the length of the eye; pedicel subglobose, one and one-third times as long as the first flagellar article; flagellum finely puberulent, all segments simple and not rounded out beneath, the first two segments longer than wide, the first one and one-half times the length of second, remaining segments except last as wide as or wider than long, ultimate article simple, terete, subequal in length to two preceding segments combined. Clypeus transverse, subfusiform, median length one-third that of compound eye; flat laterally to moderately tumid discally; produced medioapically into a short broad truncate lobe which is abruptly cuspidate medially, apical width of lobe subequal to median length of clypeus, apical margin of lobe glabrous, nitidous, perfulgid and somewhat thickened but not obviously bevelate. Mandibles falcate, apices acuminate, lower margins distinctly excised medially and provided with long ammochaetae.

Thorax fulgid; moderately clothed with decumbent silvery pubescence dorsally and on mesopleura and venter. Pronotum narrow, transverse, rather finely and closely punctate, inconspicuously notched medio-dorsally, the posterior margin impressed, anterior dorsal margin and lateral angles rounded and vertically declivous. Mesonotum with separated moderate puncturation, anterior third with a distinct double longitudinal line medially, parapsidal furrows indicated lateromedially for about one-fifth the length of mesonotum; suture between mesonotum and scutellum impressed, simple; scutellum punctured like mesonotum, gently tumid discally, ecarinate medially, laterally with narrow laminate margins; postscutellum trigonal, four-tenths the length of scutellum, flat to gently tumid discally, finely punctate. Squamae subrectangular, flat to somewhat upcurved distad, not transversely carinulate, oblique in position, contiguous behind, posterior emargination narrowly U-shaped, the apices acutely rounded. Mucro short, straight, slender, acuminate, dorsal surface weakly canaliculate, four-tenths the length of scutellum. Mesopleura subopaque, with rather close and coarse punctures, rounded anteriorly, no epicnemium, episternal suture and mesopleural pit distinctly impressed, hypersternauli obsolescent caudad; epipleura simple. Metapleura glabrous, fulgid, horizontally striate. Propodeum glabrous, subfulgid to subopaque, with a fine microscopic subfavose sculpture basically upon which is superposed a fine and irregular clathrate rugulation on dorsal and posterior faces, the latter discally with an obpyriform areole which is nitidous within; lateral carinae well developed, sublaminate medially to obsolescent ventrally below; lateral faces with a few irregular horizontal striae above.

Fore coxae simple, not sulcate anteriorly; fore tarsi with a short irregular pecten; middle and hind tibiae rather strongly spined on outer posterior margins. Hind femora straight, scarcely bowed, the genicular keel distinct and extending along distal half of dorsal surface but not appreciably fornicate apically.

Abdomen subfulgid; somewhat constricted between first two segments; moderately clothed dorsally with decumbent silvery pubescence. Tergites with distinct, well separated punctures, the venter more closely and rather coarsely punctate throughout; second sternite along the lateral margins of the inflexed tergite longitudinally concave and just mesad of this concavity and paralleling it with a longitudinal torus on each side. Hypopygium glabrous, nitidous, perfulgid, flat to inconspicuously tumid discally, the apical margin entire, gently rounded. Ultimate tergite more coarsely punctate than preceding ones, lateral margins strongly sinuous, discally on apical two-thirds with an elongate subrectangular strongly demarcated pygidial area, the apex of which is broadly rounded and the disc coarsely punctate.

Female. Unknown.

Paratype.—1 ♂, as follows:

NEW MEXICO: Almogordo, Otero County; elevation, 4350-4600 feet; April 19, 1902; (Henry L. Viereck); 1 ♂; [A.N.S.P.].

The paratypic specimen agrees with the type in all essential details except that the second abdominal tergite is very dark castaneous and the two apical tergites are ferruginous.

Distribution.—The present species is an early vernal form of the Lower Sonoran Zone, known as yet from only the type locality situated in the Tularosa Basin at the base of the western foothills of the Sacramento Range in south-central New Mexico.

Belomicrus cahuilla[30] new species (Pl. I, fig. 19; pl. II, fig. 28.)

The emarginate character of the mandibles, the long postocellar line and the structure of the male hypopygium distinguish *cahuilla* from all the other Nearctic species of *Belomicrus*. The nearest North American relatives of the present species are the preceding Forbesii Group and in particular the nominate form thereof, but the closest affinities of *cahuilla* apparently lie with the Old World Mediterranean and Eremian Caesariensis Group. A discussion of the relationships of this curious and interesting species is presented elsewhere in the sections devoted to subgenera and series and species groups of the present genus.

Type.—♂; Andreas Canyon,[31] Palm Springs, Riverside County, California. April 24, 1932. (P. H. Timberlake; on *Eriogonum fasciculatum* var. *polifolium* [California Buckwheat].) [Academy of Natural Sciences of Philadelphia, Type no. 10553.]

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[30] After the Cahuilla (*seu* Cahuilla, Coahuila, *seu* Kawai) Indians of southern California.

[31] Andreas Canyon is a side canyon of Palm Canyon, about five miles south of Palm Springs. [*Cf.* U.S. Geol Surv. Water-Supply Pap., 490-A, p. 77 and pl. VI, (1920).]

Male. 3.5 mm. long. Black; mandibles yellow basally, testaceous medially, rufous apically, the inner margins badeous. Antennae fuscous, the scapes testaceous basally and apically. The following stramineous: pronotum medially on dorsal surface, prothoracic tubercles, postscutellum, fore and middle femora narrowly annulate at apex and the former apically beneath, and all tibiae on extensor surface (fuscous on flexor surface). Median lobe of clypeus apically, tegulae, axillary sclerites, and tarsi, badeous. Hind tibiae testaceous apically. Squamae and mucro translucent hyaline. First two abdominal segments bright ferruginous, remainder fuscous to black except pygidium and hypopygium which are castaneous basally to testaceous apically. Wings clear hyaline, iridescent; stigma and venation fuscous.

Head subquadrate, slightly longer than broad in anterior aspect; front and clypeus (save for the glabrous disc) clothed with dense appressed silvery pile; vertex relatively glabrous; temples with fine appressed silvery pubescence. Front flat, inconspicuously tumid medially above; width at distal end of scapes about seven-tenths (.72) the length of eye, with fine close puncturation obscured by the pubescence; no median longitudinal sulcus from anterior ocellus. Vertex subfulgid; with close puncturation; not tuberculate behind the eyes; ocelli large, situated in a curved line, the postocellar distance five times the length of the ocellocular line, from the outer hind margins of the posterior ocelli a nitidous impression runs obliquely forward to the dorsal margin of the inner orbits. Temples normal, moderate, punctured like vertex; temporal carinae absent; post-temporal region perfulgid, with sparse acupuncturation. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus one and one-half times as far from each other as from the nearest eye margin; scape straight to slightly bowed, cylindrical, one-third the length of the eye; pedicel obterete, eight-tenths the length of the first two flagellar articles combined; flagellum finely puberulent, filiform, the first three segments as long as broad and not rounded out beneath, the remaining articles broader than long except the ultimate article which is simple, terete, and subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, flat laterally to strongly tumid discally; length medially about one-fifth the length of the eye; produced medio-apically into a short broad truncate lobe, the apical width of which is twice the median longitudinal length of clypeus, the apical margin of lobe furnished with a glabrous nitidous subbevelate area, the disc with the distal portion glabrous and nitidous. Mandibles falcate, apex acuminate; inner margin with a large strong obtuse tooth; lower margin distinctly excised medially.

Thorax fulgid; with decumbent silvery pubescence dorsally and on mesopleura and venter. Pronotum narrow, transverse, linear, finely and closely punctate; dorsal surface not notched medially; lateral angles and anterior dorsal margin rounded and vertically declivous. Mesonotum with distinct close moderate setigerous puncturation, anterior fifth with a fine median longitudinal double line, parapsidal furrows indicated lateromedially for one-fifth the length of mesonotum; suture between mesonotum and scutellum simple, moderately impressed; scutellum gently tumid, punctured like mesonotum, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, trigonal, one-fourth the length of the scutellum. Squamae flat, subrectangular, traversed by fine subparallel carinulae, oblique in position, contiguous behind, the posterior emargination narrowly V-shaped, the apices acutely rounded. Mucro short, straight, linear, parallel-sided, apex narrowly truncate, dorsal surface weakly channeled, one-half the length of the scutellum. Mesopleura with puncturation similar to mesonotum but obscured by pubescence, rounded anteriorly, no trace of an epicnemium; episternal suture and mesopleural pit moderately impressed, hypersternaulus slightly impressed anteriorly, obsolescent posteriorly. Metapleura glabrous, fulgid, horizontally striate. Propodeum glabrous, subfulgid; dorsal face finely favose, obliquely lineate laterally adjacent to the lateral carinae and posteriorly; posterior face flat, finely favose, lateral areas traversed by irregular horizontal fine rugulae, discal areole obtrigonal, indistinct, particularly above; lateral carinae well developed, sublaminate above, abruptly obsolescent ventrally below and obscurely bifid there; lateral faces with strong horizontal rugulae between which the surface is finely favose.

Fore coxae simple, not sulcate anteriorly; fore tarsi without traces of a pecten. Middle and hind tibiae strongly spined on outer posterior margin. Hind femora weakly bowed, the genicular area sharply carinate above and very weakly fornicate apically.

Abdomen subfulgid; constricted between the segments; clothed with moderately long decumbent pubescence. Tergites with fine close puncturation; ultimate tergite with an indistinctly demarcated subquadrate to trapeziform pygidial area, the lateral margins of which converge slightly caudad, the apex gently arcuate, the disc flat and coarsely punctate. Sternites subnitidous, with fine sparse scattered acupuncturation; hypopygium subquadrate, flat, nitidous, glabrous, the apex subtruncate and weakly bisinuate thus giving it the appearance of being weakly and obscurely tridentate.

Female. Unknown.

Paratypes.—3 males, as follows:

CALIFORNIA: Andreas Canyon, Palm Springs, Riverside County; May 11, 1935; (P. H. Timberlake; on *Eriogonum fasciculatum* var. *polifolium* [California Buckwheat]); 3♂; [Timberlake].

Except that the anterior declivous surface of the pronotum is longitudinally lineate, the paratypes agree with the type in all essential details of livery and structure.

Distribution.—The present species is a late vernal to early aestival form, known so far only from Andreas Canyon, the type locality, where Dr. Timberlake has taken it at flowers of California buckwheat in company with *Ammoplanops timberlakei* and *Pulverro serrano.*[32] Like the latter species,[32] *cahuilla* may eventually be found rather generally distributed throughout the Colorado Desert of southern California.

Belomicrus serrano[33] new species

This and the following three species comprise a compact group of closely related forms, the diagnostic characters of which will be given in the section dealing with the taxonomy of *Belomicrus.*

From all the other members of the Franciscus Group, *serrano* may be distinguished by the nitidous post-temporal region of the head, the shorter antennal scapes, and the narrower, shorter median clypeal lobe which in the male sex is squarely truncate apically rather than retuse, emarginate or sinuous as in *jurumpa, franciscus* or *quemaya.* In addition, the present species may be separated from both *jurumpa* and *franciscus* by the somewhat narrower front, agreeing in this respect with *quemaya* from which it may be distinguished by the slightly longer postocellar line, the structure of the clypeus and other characters given in the following description and the key to species.

The present species breaks up into two geographic races, one of which is apparently limited to the southern montane district, the foothills and the piedmont area of the Transverse Ranges[34] region of Los Angeles, Riverside and San Bernardino Counties in southern California, while the other occurs in the middle and upper Owens Valley district of California, east of the Sierra Nevada. These races are differentiated and discussed separately below.

Belomicrus serrano serrano new subspecies

(Pl. I, fig. 21; pl. II, figs. 26, 51.)

? *Belomicrus cladothricis* Baker, Pomona Coll. Journ. Ent., I, p. 30, (1909); [Claremont, California]. (Not of Cockerell, 1895.)

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[32] Trans. Amer. Ent. Soc., LXIV, p. 415-416, (1938 [1939]).

[33] After the Serrano Indians of southern California.

[34] The term "Transverse Ranges" is used here in the sense of R. D. Reed. [*Cf.* his *Geology of California,* Amer. Ass. Petr. Geol., 1933.]

The nominate form of *serrano* is distinguished from the atypical subspecies, which unfortunately is known as yet only from the female sex, by a number of relative characters. The livery of the typical *serrano* is much more extensive, brighter and lighter than in the atypical race. Moreover, in the nominate form, the mesonotum and scutellum are more closely punctate and the propodeum is in general more delicately sculptured with the discal areole of the posterior face much more poorly defined in comparison with the atypical subspecies which conversely has the middle and hind tibiae more strongly and heavily spined. The most distinctive character, however, separating *serrano serrano* from *serrano mono* lies in the clypeus; in the atypical race the clypeal bevel is very strongly concave and sharply margined along the dorsal edge whereas in the nominate form the bevel is weakly and inconspicuously concave and weakly margined at most along its dorsal edge.

Type.—♂; Tujunga Wash, San Gabriel Mountains, Los Angeles County, California. April 17, 1927. (P. H. Timberlake; on sandy ground.) [Academy of Natural Sciences of Philadelphia, Type no. 10554.]

Male. 4 mm. long. Black; the following deep stramineous: mandibles except for apices and distal inner margins which are rufous, median lobe of clypeus from apex of tubercle almost to apical margin, palpi, scape, pronotum dorsally to and including the tubercles, postscutellum, fore femora apically and beneath, middle and hind femora apically, all tibiae and metatarsi, and first abdominal tergite with a preapical fascia. The following light fulvous: apical margin of median clypeal lobe, distal four segments of all tarsi, and tegulae and axillary sclerites. Pedicel and flagellum light fuscous above, luteous beneath. Squamae pellucid-hyaline. Abdomen bright ferruginous. Wings clear hyaline; stigma and veins fuscous.

Head subquadrate, broader than long in anterior aspect; lower half of front, except for glabrous scapal scrobes, and clypeus, save distomedially, clothed with dense appressed silvery pile; upper half of front, and vertex with shorter suberect puberulent silvery to aeneous inconspicuous pubescence; temples with fine appressed silvery puberulent pubescence. Front save for nitidous scapal scrobes with moderate close fine puncturation, the width at distal end of scapes five-eighths the vertical length of eye, without an impressed median longitudinal line above from the anterior ocellus. Vertex subfulgid, with puncturation like that of front; without postocular tubercules; ocelli large, situated in a curved line, the postocellar line three times the length of the ocellocular, from outer anterior margin of hind ocelli an arcuate nitidous furrow runs obliquely forward to dorsal margin of eye. Temples normal, moderate, striatopunctate; temporal carinae wanting; post-temporal region glabrous and nitidous. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus twice as far from each other as from nearest eye margin; scape straight, obterete, three-eighths the length of the compound eye; pedicel subobconical, about eight-tenths the length of the first two flagellar articles combined; flagellum finely puberulent, first segment a little longer than wide and slightly longer than the second segment, neither rounded out beneath, second to penult segments broader than long, ultimate article simple, terete, subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, length medially about one-quarter that of eye; flat laterally to triangularly tuberculate discally; produced medioapically into a short broad subtruncate lobe, the distal width of which is almost three-eighths (.36) the length of the eye, or twice the length of the distance measured from the apex of the discal tubercle to the apical margin; a raised, glabrous nitidous, flat and equilaterally triangular, obliquely declivent platform (without impressions or a bevel present) from apex of discal tubercle to apical margin. Mandibles falcate, apices acuminate; inner margin with a large strong tooth medially; lower margin simple, entire, arcuate.

Thorax subfulgid; with short, suberect, inconspicuous light puberulent pubescence dorsally, mesopleura and venter with conspicuous appressed silvery pubescence. Pronotum narrow, transverse, linear, with fine close puncturation; dorsal surface very inconspicuously notched medially, posterior margin narrowly impressed; anterior dorsal margin and lateral angles rounded; anterior surface vertically declivent. Mesonotum with close moderate fine puncturation, anterior third with a faint trace of a median longitudinal double line; suture between mesonotum and scutellum impressed, simple; scutellum subsemicircular, flatly tumid, punctured like mesonotum with a tendency toward becoming striatopunctate, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, subtrigonal, almost one-third the length of the scutellum, radiately lineate. Squamae oblique in position, subrectangular, contiguous behind and enclosing the postscutellum, traversed by fine subparallel carinulae, apices bluntly acute, posterior emargination narrowly V-shaped. Mucro short, about one-third the length of the scutellum, straight, acuminate, finely canaliculate above. Mesopleura with close moderate fine puncturation, rounded anteriorly, no epicnemium, episternal suture and mesopleural pit moderately impressed, hypersternaulus obsolescent, epipleura simple. Propodeum glabrous, fulgid, surface sculpture finely favose basically; dorsal surface with very fine oblique subparallel carinulae; posterior face horizontally traversed laterally by carinulae similar to dorsal face, discally with a weakly demarcated subobovate areole which is acute below and subnitidous within; lateral carinae well developed, sublaminate above, obsolescent ventrally below; lateral faces with horizontal striae.

Fore coxae simple anteriorly, not sulcate; fore tarsi without a pecten. Middle tibiae moderately and hind tibiae more strongly so, spinose on outer posterior faces. Hind femora strongly bowed, the genicular area with a strong carinate keel above which is moderately fornicate apically.

Abdomen subfulgid; clothed with a decumbent silvery pubescence; not constricted between the segments. Tergites with a close fine puncturation; sternites with a finer sparser puncturation; ultimate tergite without a pygidium; last sternite with a transverse median nitidous and glabrous welt basally, distad of which the surface is punctate and the margin shallowly and arcuately emarginate.

Allotype.—♀; Claremont, Los Angeles County, California. (C. F. Baker.) [Academy of Natural Sciences of Philadelphia.]

Female. 4 mm. long. The following features are solely those noteworthy of difference from the ones given in the foregoing description of the male (type).

Clypeus without yellow maculation.

Head with apical margin of median clypeal lobe retuse and with a broad glabrous nitidous subbevelate area which is inconspicuously concave and weakly margined at most along its dorsal edge. Temporal and mandibular ammochaetae present.

Thorax in general similar to male but the propodeum more delicately sculptured, with the discal areole of the posterior face obsolescent.

Fore legs with the humeral, trochanteral and femoral ammochaetae present; the tarsi with a strong pecten.

Abdomen like male but ultimate tergite with a subequilaterally trigonal pygidium, the surface of which is more or less opaque and furnished with a fine reticulate or favose lineation between the scattered coarse punctures.

Paratypes.—11; 8 males, 3 females, as follows:

CALIFORNIA: Tujunga Wash, San Gabriel Mountains, Los Angeles County; April 17, 1927, 1927; (P. H. Timberlake; on sandy ground); 1 ♂; [Timberlake]. Claremont, Los Angeles County; (C. F. Baker); 5 ♂, 1 ♀; [Timberlake and Cornell]. Riverside, Riverside County; March 21, 1934; (P. H. Timberlake; sunning self on ground); 1 ♂; [Timberlake]. Two miles west of Perris, Riverside County; March 19, 1936; (P. H. Timberlake; on *Baeria chrysostoma* var. *gracilis* [Gold Fields]); 1 ♂; [Timberlake]. Near Crestline, San Bernardino Mountains, San Bernardino County, May 13, 1934; (P. H. Timberlake; on *Potentilla glandulosa*); 1 ♀; [Timberlake]. Redlands, San Bernardino County; (F. R. Cole); 1 ♀; [U.S.N.M.].

The paratypic specimens agree with the types in all essential particulars of livery and structural detail.

Remarks.—This may be the species Baker in 1909 recorded as "*cladothricis*"[35] and reported as common about Claremont, California, during the early spring. I have seen material of *serrano* from Claremont, collected by Baker, and so labelled. There is, of course, a possibility that Baker may have had *cladothricis,* for the species occurs in this area, although the form found in the piedmont is apt to be an atypical race. But this latter form, like the nominate race of *cladothricis,* is largely a middle to late aestival and autumnal form, whereas *serrano serrano* is apparently a vernal to early aestival species. Aside from the fact that the two species belong to the same genus and that they bear a very superficial resemblance to one another, at least from the standpoint of the livery, *serrano* and *cladothricis* have little in common; each belongs to an entirely different complex,—the present species to the Forbesii Series and *cladothricis* to the Vierecki Series.

Distribution.—The nominate race of *serrano* is a vernal to early aestival form, confined, so far as the present records indicate, to the southern foothills and the piedmont of the San Gabriel and San Bernardino Ranges of southern California. Like the atypical subspecies of *cladothricis,* the southern portion of whose geographic range coincides in large measure with the known distribution of the present form, *serrano serrano* inhabits a relatively more humid region than its atypical race, *serrano mono.*

Belomicrus serrano mono[36] new subspecies (Pl. II, fig. 25.)

The differential features separating this geographic race from the nominate subspecies have been presented on a preceding page in the introductory discussion of the typical *serrano.*

Type.—♀; Sherwin Hill, five miles north of Round Valley, Owens Valley, Mono County, California. Elevation, 5500 feet. August 3, 1937. (Rehn, Pate & Rehn.) [Academy of Natural Sciences of Philadelphia, Type no. 10555.]

Female. 4 mm. long. The following description is largely comparative with that of the female sex of the preceding typical (or nominate) form of *serrano,* and stresses solely those characters showing sufficient difference worthy of being noted.

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[35] Pomona Coll. Journ. Ent., I, p. 30, (1909).

[36] After the Mono Indians of the Owens Valley district of eastern California, where the present race occurs.

Livery in general darker and not as extensive as in nominate form. Legs eburneostramineous on extensor surface and fulvous to fuscous on flexor surface; tarsi fulvous to fuscous; scapes fulvous, the pedicel and flagellum croceous beneath and light fuscous above.

Head with clypeal bevel very strongly concave, the dorsal edge sharply margined. Pronotum with the anterior surface strongly longitudinally lineate. Mesonotum and scutellum distinctly fulgid, and with puncturation much sparser and more scattered than in typical form. Propodeum more coarsely sculptured, the discal areole of the posterior face distinct and well defined. Middle and hind tibiae more strongly spinose on outer posterior margins.

Male. Unknown.

Distribution.—The atypical subspecies of *serrano* is known as yet only from the Owens Valley region of eastern California and apparently occurs much later in the summer than the nominate race. As in the typical subspecies of *cladothricis,* the present atypical race of *serrano* inhabits a more xeric area than its nominate form, *serrano serrano.*

Belomicrus quemaya[87] new species (Pl. I, fig. 23; pl. II, fig. 49.)

Although resembling *serrano* and *franciscus* so closely as to be easily confused with them, *quemaya* differs from both in a number of details, all of which are described below. The most outstanding character is the appreciably narrower and shorter median lobe of the clypeus. From *franciscus,* the present species may be distinguished by the relatively shorter antennal scape and the narrower front, agreeing in these particulars with *serrano* from which it may be separated by the distinctly punctate posttemporal region of the head and the shorter postocellar line.

Type.—♂; Palm Springs, Riverside County, California. March 26, 1932. (P. H. Timberlake; on *Malva pusilla.*) [Academy of Natural Sciences of Philadelphia, Type no. 10556.]

Male. 3.5 mm. long. Black; the following deep stramineous: mandibles save for their rufous apices, clypeal platform dorsally, scape, pedicel beneath, pronotum dorsally to an including the tubercles, postscutellum, mucro apically, axillary sclerites, first six abdominal tergites with a transverse pre-apical fascia each of which is widened medially, fore femora

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[87] After the Quemaya (*seu* Kamia, Comeya, *seu* Kamya) Indians, a tribe of Yuman stock inhabiting southern California.

beneath and at apex, middle and hind femora narrowly at apex, and all tibiae on outer face, and metatarsi. The following testaceous: median lobe of clypeus apically, trophi, and tegulae. The following fulvous: pedicel above, flagellum, all femora medially, flexor surface of tibiae, and the four distal segments of the tarsi. Abdomen bright ferruginous above, darker ventrally. Squamae and mucro medially, pellucid-hyaline. Wings clear hyaline, iridescent; stigma and veins fulvous.

Head subquadrate, broader than long in anterior aspect; front save for the glabrous antennal scrobes, and the clypeus with the exception of the glabrous discal platform, clothed with a dense appressed silvery pile; vertex with short inconspicuous suberect subaeneous puberulent pubescence; temples sparsely clothed with appressed silvery puberulent pile; post-temporal region almost glabrous. Front save for the nitidous antennal scrobes with fine moderately close puncturation; width at distal end of scapes five-eighths the length of the eye; scapal area shallowly concave and medially between the scrobes with a short longitudinal impression, but without a median longitudinal furrow above emanating from the anterior ocellus; mesad of upper inner orbits on each side with a small flat to inconspicuously concave area. Vertex subfulgid, with puncturation similar to that of front; without postocular tubercles; ocelli large, situated in a curved line, the postocellar distance two and eight-tenths the length of the ocellocular line, from the outer margins of the hind ocelli a shallow opaque groove runs obliquely forward to the dorsal margin of the eye. Vertex temples and post-temporal region subopaque, with moderate fine and close puncturation throughout; temporal carinae wanting. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus twice as far from each other as from the nearest eye margin; scape straight, cylindrical to subobterete, seven-sixteenths (.4375) the length of the eye; pedicel subcylindrical, one and one-half times as long as the first flagellar article; flagellum finely puberulent, none of the segments rounded out beneath, first two articles subequal in length and slightly longer than wide, remaining segments except last as wide as or wider than long, the last article simple, terete, subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform; length medially about one-fourth that of eye; flat laterally, raised discally into a gently declivous, nitidous, glabrous, subcampanulate platform which is one and one-third times as wide apically as high, the apical half strongly and abruptly sublunately impressed and the apical margin sinuous. Mandibles falcate, apices acuminate; lower margin simple, entire, arcuate; inner margin furnished with a large acute tooth medially.

Thorax fulgid; with short inconspicuous erect light pubescence dorsally, mesopleura and venter with appressed silvery pubescence. Pronotum narrow, transverse, linear, with fine close acupuncturation; dorsal surface very inconspicuously notched medially; posterior margin narrowly impressed; anterior dorsal margin and lateral angles rounded, the anterior surface vertically declivous. Mesonotum with moderate fine separated puncturation, anterior third with an inconspicuous longitudinal double line medially;

suture between mesonotum and scutellum impressed, simple; scutellum subsemicircular, flatly tumid, punctured like mesonotum but with a tendency toward becoming striatopunctate, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, trigonal, two-fifths the length of the scutellum and finely rugulose. Squamae subrectangular, oblique in position, contiguous behind and thus completely enclosing the postscutellum, traversed by fine subparallel carinulae, the apices bluntly rounded and flaring upwards somewhat, the posterior emargination V-shaped. Mucro short, about two-fifths the length of the scutellum, straight, acuminate, indistinctly and finely canaliculate above. Mesopleura with moderate, fine close puncturation; rounded anteriorly, no epicnemium; episternal suture and mesopleural pit distinctly impressed, hypersternaulus obsolescent; epipleura simple. Metapleura glabrous, fulgid, coarsely and horizontally striate. Propodeum glabrous, subfulgid; dorsal and posterior faces finely favose and traversed by fine irregular clathrate lineations; discal areole of posterior face distinct, trigonal, the dorsal angle obtuse, the ventral angle acuminate, concave and nitidous within; lateral carinae well developed, sublaminate dorsally, abruptly effaced ventrally below; lateral faces horizontally striate.

Fore coxae simple, not sulcate anteriorly; tarsi without a pecten. Middle and hind tibiae strongly spinose on outer posterior faces. Hind femora strongly bowed, the genicular area with a strong carinate keel distad above which is distinctly fornicate apically.

Abdomen subfulgid; not appreciably constricted between the segments; clothed with decumbent argenteous pile. Tergites with a fine close puncturation; sternites fulgid, with a fine well separated acupuncturation. Last tergite without a pygidium, the puncturation somewhat coarser than on the preceding tergite. Hypopygium flat, acupunctate and with sparse puberulent pile basally and on the trigonal areas at the distolateral angles, discally glabrous, nitidous and tumid, the caudal margin broadly retuse.

Female. Unknown.

Paratype.—1 male, as follows:

CALIFORNIA: Eight miles west of Kane Spring, Salton Sink, Imperial County; May 25, 1933; (P. H. Timberlake; on *Sphaeralcea ambigua* [Desert Hollyhock[38]]); 1 ♂ ; [Timberlake].

Variation.—The paratypic specimen from Kane Spring agrees in all essential respects with the type from Palm Springs except that the apical margin of the median lobe of the clypeus is almost straight rather than distinctly sinuous, while the abdomen instead of being bright ferruginous above is a much darker red, almost deep miniatous, with the yellow fasciae narrower and present on only the first, third and fourth tergites.

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[38] Also known as either the Desert or Apricot Mallow.

Distribution.—This eremian form is known at present from only the two male specimens recorded above, both of which were taken at mallow flowers. The species is apparently a middle vernal to early aestival form of the Salton Sink and the adjacent Colorado Desert region of southern California.

Belomicrus franciscus Pate (Pl. I, fig. 20; pl. II, figs. 27, 52.)

Belomicrus franciscus Pate, Ent. News, XLII, p. 77, (1931); [♂, ♀; Lone Mountain, San Francisco, California].—Williams, Pan-Pacif. Ent., XII, pp. 3-6, fig. 2, (1936); [biology].

Superficially this central west coast form has the same general facies of the other members of the Franciscus Group but may be distinguished from all of them by the curious and interesting structure of the clypeus. The diagnostic pattern of *franciscus* is otherwise intricate and difficult. The structure of the clypeus is rather like that of *quemaya* but the clypeal lobe of *franciscus* is distinctly broader than in *quemaya*. Moreover, in the present species the scape is relatively longer, the front broader and the postocellar line shorter than in *quemaya* and likewise *serrano*, agreeing in these particulars with *jurumpa* from which it may be separated by the narrower and differently shaped clypeal lobe and the presence of an impressed median longitudinal line on the front.

Type.—♂; Lone Mountain, San Francisco, California. "Late April and May, 1930." (Francis X. Williams.) [Academy of Natural Sciences of Philadelphia, Type no. 10557.]

Male. 5 mm. long. Black; the following deep stramineous: mandibles except for rufous apices and tooth on inner margin, the flat ridge of the clypeal lobe, scape save for a brunneous spot posteriorly, pedicel and flagellum beneath, pronotum dorsally to and including the tubercles, axillary sclerites, scutellum with a small spot at each anterior lateral angle, postscutellum, fore and middle femora apically and beneath, hind femora narrowly annulate at apex, all tibiae on extensor surface, all metatarsi, first six abdominal tergites with a preapical fascia, that of the first segment the widest, and disc of pygidium. Median lobe of clypeus distad of oblique ridge, and apical four tarsal segments, fulvous; tegulae fulvous-hyaline. Squamae, and mucro apically, pellucid hyaline. Abdomen bright ferruginous, the first two sternites deeply infuscated and brunneous discally. Wings clear hyaline, iridescent; stigma and veins fulvous.

Head fulgid, subquadrate, slightly longer than broad in anterior aspect; front save for the glabrous antennal scrobes, and clypeus, except for the disc of median lobe, clothed with dense appressed silvery pile; vertex more sparsely clothed with inconspicuous, suberect, subaeneous puberulent pubescence; temples with sparse appressed silvery puberulent pile. Front with fine close puncturation save for the nitidous, somewhat concave antennal scrobes; width at distal end of scapes two-thirds the vertical length of the eye; lower half broadly, shallowly concave; discally just above apices of scapes distinctly tumid; with a strong impressed median longitudinal line above from anterior ocellus and laterad of this on each side along upper region of inner orbits with a broad and shallowly concave area. Vertex fulgid, with puncturation similar to that of front; without postocular tubercles; ocelli large, situated in a curved line, the postocellar distance two and one-half times the length of the ocellocular line, from outer hind margins of posterior ocelli a narrow deeply impressed nitidous groove runs obliquely forward to the dorsal margin of each eye. Temples normal, moderate; temporal carinae wanting; temples and post-temporal region with fine, well separated puncturation Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus twice as far from each other as from the nearest eye margin; scape straight, obterete. a little less than half (.466) the vertical length of the eye; pedicel subcylindrical, slightly longer than the first flagellar article; flagellum finely puberulent, first two segments subequal in length, longer than broad and not rounded out beneath, remaining segments except last broader than long, the ultimate article simple, terete, subequal in length to the two preceding articles combined. Clypeus transverse, subfusiform, length medially one-fourth that of eye; flat laterally to strongly, triangularly tuberculate discally; produced medio-apically into a short broad lobe which is broadly, deeply, and subsemicircularly excised distally, and which has a flat raised glabrous nitidous ridge running obliquely from each distolateral angle to the apex of the discal tubercle, distad of this ridge the surface is abruptly impressed to form a narrow glabrous nitidous lunate area between the ridge and the excised apical margin; the distal width of the median lobe twice the length of the distance measured from the apex of the discal tubercle to a transverse line drawn between the distolateral angles. Mandibles subfalcate, apices acute; inner margins with a large acute tooth medially; lower margin simple, entire, arcuate.

Thorax subfulgid; thinly clothed with short inconspicuous suberect puberulent pubescence which is light aeneous dorsally and silvery on mesopleura and venter. Pronotum narrow, transverse, finely punctate, dorsal surface inconspicuously notched medially, the posterior margin narrowly but strongly impressed, anterior dorsal margin and humeral angles rounded. Mesonotum with fine separated puncturation, anterior third with a fine double longitudinal line medially; suture between mesonotum and scutellum simple but very deeply impressed; scutellum semicircular, flatly tumid, punctured like mesonotum, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, trigonal, more closely punctate than scutellum and one-third the length of it. Squamae flat, subrectangular, oblique in position, contiguous behind, traversed by fine parallel carinulae, apices bluntly rounded, posterior emargination broadly V-shaped. Mucro straight, linear, one-third the length of scutellum, finely canaliculate above, apex narrowly truncate. Mesopleura with puncturation similar to mesonotum; rounded anteriorly, no epicnemium; episternal suture impressed and more or less foveolate, the mesopleural pit distinct, hypersternauli faint. Epipleura simple. Metapleura glabrous, fulgid, horizontally striate. Propodeum glabrous, subopaque, basic sculpture microscopically favose throughout; dorsal and posterior faces with lateral portions traversed by fine indistinct oblique subparallel rugulae, discal areole of posterior face obtrigonal, well demarcated laterally and below but obsolete above, opaque and granulate within; lateral carinae well developed, sublaminate above, obsolescent ventrally; lateral faces with fine indistinct horizontal striae.

Legs with fore coxae simple, nonsulcate; forse tarsi without a pecten. Middle and hind tibiae moderately spinose on extensor surface. Hind femora moderately bowed, the genicular area with a strong carinate keel above and distinctly fornicate distally.

Abdomen subfulgid, slightly constricted between the segments; clothed with a fine sparse decumbent silvery pubescence on tergites, the sternites more sparsely and inconspicuously clad. Tergites with fine moderate close acupuncturation; the ultimate tergite with a poorly defined subquadrate pygidium, the apical margin of which is entire, the disc coarsely punctate. Sternites fulgid, with sparse very fine acupuncturation; hypopygium discally to medio-apically with a triangular tumid glabrous nitidous area, the apex retuse, the distolateral angles flat, finely punctate and puberulent.

Allotype.—♀; Topotypical. Same data as type. [Academy of Natural Sciences of Philadelphia.]

Female. 4.75 mm. long. Agrees with the male (type) in all essential respects except the following features:

Livery in general the same as in male but the antennal flagellum is fulvous above and the scutellar spots are larger.

Clypeus with the apical margin of the median lobe broadly and shallowly retuse, and bevelate area just below discal tubercle horizontally striate.

Psammophore with the mandibular, temporal, humeral, trochanteral, and femoral ammochaetae present and well developed.

Fore tarsi with a distinct pecten.

Last abdominal tergite with a trigonal pygidium, the disc of which is subfulgid and furnished with a fine microscopic clathrate lineation between the scattered coarse punctures.

Remarks.—Williams reports that *Belomicrus franciscus* was not infrequently seen in late April and May, 1930, sunning itself on a tiny path, visiting the flowers of the little sand-mat (*Pentacaena ramosissima*), or engaged in nesting activities on Lone

Mountain near San Francisco, California. An account of the biology of this form will be found in the section devoted to a discussion of the ethology of the genus *Belomicrus*.

Specimens examined: 7; 6 males, 1 female, as follows:

CALIFORNIA: Lone Mountain, San Francisco; April and May, 1930; (F. X. Williams); 6♂, 1♀; [Williams; V. S. L. P.; Cornell].

Distribution.—The present species is an early aestival, central west coast form. I have seen no material of *franciscus* other than the type series recorded above.

Belomicrus jurumpa[39] new species (Pl. I, fig. 22; pl. II, fig. 50.)

The present species has in general the superficial habitus of *serrano, quemaya* and *franciscus,* but is distinguished from all of them by the much longer, broader and differently formed median lobe of the clypeus and the appreciably shorter postocellar line. In addition, *jurumpa* may be separated from both *quemaya* and *serrano* by the relatively longer antennal scape and broader front, and from the latter form by the distinctly punctate posttemporal region of the head, agreeing in all these particulars with *franciscus* from which it may be differentiated by the characters given above.

Type.—♂; Gavilan,[40] Riverside County, California. April 17, 1938. (P. H. Timberlake; on *Cryptantha intermedia* [White Forget-me-not].) [Academy of Natural Sciences of Philadelphia, Type no. 10558.]

Male. 3.5 mm. long. Black; the following stramineous: mandibles except apices and inner margins which are light rufous, clypeus along upper margin of bevel, scapes save for a small fuscous spot on inner posterior surface, pronotum to and including the tubercles, postscutellum, axillary sclerites, first abdominal tergite with a preapical fascia, fore femora beneath and at apex, middle and hind femora narrowly annulate at apex, all tibiae entirely, and fore tarsi. Pedicel and flagellum light fuscous above, sordid deep stramineous beneath. Clypeal bevel, palpi, and middle and hind tarsi, fulvous. Squamae and mucro, hyaline, semipellucid. Wings clear hyaline, iridescent; stigma and venation fuscous.

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[39] After Jurumpa (*seu* Hurumpa), a former Serrano site near Riverside, California.

[40] This is a plateau region near, and to the south of Riverside, between Gavilan Peak and the Cajalco Reservoir to the north of it, known locally as "The Gavilan."

Head subquadrate, broader than long in anterior aspect; front except for glabrous scapal scrobes, and clypeus clothed with dense appressed silvery pile; vertex with inconspicuous short suberect puberulent silvery pubescence. Front except for nitidous scapal scrobes with moderate fine close puncturation, scapal area broadly and shallowly concave, medially with an indistinct impressed longitudinal line, mesad of inner orbits dorsally on each side with a shallow concave longitudinal basin, width at distal end of scapes two-thirds the length of eyes. Vertex fulgid, with puncturation similar to front, not tuberculate behind eyes; ocelli large, situated in a curved line, postocellar distance two and one-half times the length of the ocellocular line, from outer posterior margin of hind ocelli a narrow, sharply impressed, arcuate sulcus runs obliquely forward to the dorsal margin of the eye. Temples fulgid, normal, moderate, striatopunctate above and anteriorly passing to well separated punctures below and behind and continued throughout on post-temporal region; temporal carinae wanting. Antennae short, reaching about to occiput, situated low on face along dorsal margin of clypeus twice as far from each other as from the nearest eye margin; scapes straight, obterete, a little more than three-sevenths (.466) the length of the eye; pedicel cylindrical, depressed, two-thirds the length of the first two flagellar articles combined; flagellum finely puberulent, first two segments a little longer than broad, remainder to last broader than long, the first segment slightly longer than the second, neither rounded out beneath, ultimate article simple, terete, elongate, subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, flat laterally to subtriangularly tuberculate discally, length medially (measured from the dorsal margin to a transverse line drawn between the distolateral angles of the median lobe) about four-tenths that of the eye; produced medio-apically into a short broad lobe which is broadly and deeply excised distally and which has a sharp oblique margin from the distolateral angles to the discal tubercle, distad of which is a very narrow, linear, concave, inflexed nitidous and glabrous bevel, the distal width of the median lobe three times the length of the distance measured from the apex of the discal tubercle to a transverse line drawn between the distolateral angles. Mandibles falcate, apices acute; inner margins with a large acute tooth medially; lower margin simple, entire, arcuate.

Thorax fulgid; with short suberect inconspicuous light aeneous puberulent pubescence dorsally, mesopleura and venter with appressed silvery pubescence. Pronotum narrow, transverse, linear, with fine close puncturation, dorsal surface very inconspicuously notched medially, posterior margin narrowly impressed, anterior dorsal margin and lateral angles rounded, the anterior surface vertically declivous. Mesonotum with moderate fine separated punctures, anterior third with a distinct longitudinal parallel double line medially; suture between the mesonotum and scutellum simple, impressed; scutellum subsemicircular, flatly tumid, punctured like mesonotum but with a slight tendency toward becoming striatopunctate, not carinate medially, laterally with narrow laminate translucent margins;

postscutellum flat, subtrigonal, about one-third the length of the scutellum. Squamae subrectangular, oblique in position, contiguous behind and enclosing the postscutellum, traversed by fine subparallel carinulae, apices bluntly rounded, posterior emargination acute, broadly V-shaped. Mucro short, straight, linear, about two-fifths the length of the scutellum, apex subtruncate, finely canaliculate below. Mesopleura with moderate fine puncturation, rounded anteriorly, no epicnemium, episternal suture and mesopleural pit distinctly impressed, hypersternaulus obsolescent; epipleura simple. Metapleura glabrous, horizontally striate. Propodeum glabrous, subfulgid; dorsal face finely favose, traversed by fine irregular oblique lineations; posterior face with lateral areas finely favose and confusedly lineate, discal areole distinct, cuneiform, microscopically subfavose within; lateral carinae well developed, sublaminate above, abruptly obsolescent ventrally below; lateral faces horizontally striate anteriorly to finely irregularly clathrate posteriorly.

Fore coxae simple, not sulcate anteriorly; fore tarsi without a pecten. Middle and hind tibiae strongly spinose on outer posterior faces. Hind femora strongly bowed, the genicular area with a strong carinate keel above which is moderately fornicate distally.

Abdomen subfulgid; not appreciably constricted between the segments; moderately clothed with decumbent argenteous pile. Tergites with a microscopic clathrate aciculation upon which is superposed a fine moderate separated series of punctures. Sternites fulgid, with a fine sparse acupuncturation. Last tergite without a pygidial area, the disc more coarsely punctate than the preceding tergite. Last sternite (hypopygium) tumid discally to medio-apically and glabrous and nitidous there, the base and distolateral angles flat and finely punctate, caudal margin angularly emarginate.

Allotype.—♀; Whitewater Canyon, Riverside County, California. April 25, 1936. (P. H. Timberlake; on *Eriogonum fasciculatum* [California Buckwheat].) [Timberlake.]

Female. 4 mm. long. Black; the following stramineous: mandibles basally, scapes anteriorly, pronotum dorsally to and including the tubercles, axillary sclerites, scutellum with a broad band laterally which is confluent posteriorly, postscutellum, first five abdominal tergites with a preapical fascia, pygidium discally, fore and middle femora apically beneath, hind femora narrowly at apex, fore, middle and hind tibiae with a broad longitudinal stripe on extensor surface. The following fulvous; mandibles medially (the apices rufous), clypeal bevel, antennae, legs distad of trochanters exclusive of stramineous maculation, and tegulae. Abdomen bright ferruginous. Wings clear hyaline, iridescent; stigma and venation dark fulvous.

Head fulgid; as in male but the front with silvery pile laterally only, puncturation not as close. Vertex as in male. Temples simply punctate throughout, post-temporal region nitidous; temporal and mandibular ammochaetae present. Antennae, clypeus and mandibles as in male.

Thorax fulgid; generally as in male but puncturation not as close; anterior face of pronotum strongly and longitudinally lineate. Propodeum subfulgid, with lateral faces horizontally striate throughout. Otherwise as in male.

Fore legs with humeral, trochanteral and femoral ammochaetae present; fore tarsi with a distinct pecten. Otherwise as a male.

Abdomen generally as in male but moderately constricted between the segments. Ultimate tergite with a trigonal pygidium, the disc of which is perfulgid and provided with a few scattered coarse punctures. Second and third sternites perfulgid, with a sparse scattered acupuncturation; remaining sternites subnitidous; last sternite narrowly truncate apically, with a short, indistinct, median carinula distally, on each side of which is a pencil of hairs apically.

Distribution.—The present species is apparently a vernal to early aestival form, known as yet from only a single pair,—a male taken in the Gavilan plateau region south of Riverside and a female captured in the canyon of the Whitewater River which drains into the Colorado Desert to the south. Inasmuch as the prevailing winds across the San Gorgonio Pass, which lies between the two localities, are from the west or northwest,[41] it may not be too venturesome to assume that the original home of *jurumpa* was in the piedmont of the Transverse Ranges district[42] of southern California and that it has been carried across the pass and into the Colorado Desert region by wind. Further collecting will reveal how correct this tentative assumption is.

Belomicrus vierecki[43] new species (Pl. I, fig. 7; pl. II, figs. 46, 47.)

This and the following ten species constitute a distinct series separable from the foregoing twelve forms by the transverse rectangular postscutellum with the squamae situated laterally and varying in shape from semicircular to falcate or subreniform. A discussion of the relationships and the diagnostic features of the present complex of which *vierecki* is the nominate species will be found under the section dealing with the series and species groups of *Belomicrus*.

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[41] *Cf.* U.S. Geol. Surv. Water-Supply Pap. no. 497, p. 15, (1923). *V. et.*: E. C. Jaeger, The California Deserts, pp. 37-38, Stanford Univ. Press, 1933.

[42] *Cf.* footnote 34 under *Belomicrus serrano*.

[43] Dedicated to the late Henry Lorenz Viereck, who took the first specimens of this interesting and widespread little species on his first collecting trip to the southwest in 1902.

From all the forms that follow, *vierecki* is distinguished by the strong and well developed temporal carinae and the nitidous postocular callosities. In the other North American species of the Vierecki Series, the temporal carinae are absent while the postocular armature partakes of the nature of distinct, opaque and usually punctate tubercles. Like *sechi*, the males of *vierecki* have the fore coxae simple and non-sulcate, but the interantennal distance of the present form is twice the length of the antennocular line and the scapes are simple and terete, whereas in *sechi* the distance between the antennal sockets is but eight-tenths that between them and the nearest eye margin and the scapes are constricted basally and curiously inflated distally. The squamae of *vierecki* are slender and distinctly falciform, resembling *bridwelli* in this respect, but, in addition to the characters given above, *vierecki* is readily distinguished from that form by the non-sulcate fore coxae of the males, the absence of the calcaral furrow on the middle tibiae, and the structure of the propodeum.

Type.— ♂ ; Alamogordo,[44] Otero County, New Mexico. Elevation, 4320-4600 feet. May 10, 1902. (Henry L. Viereck.) [Academy of Natural Sciences of Philadelphia, Type no. 10559.]

Male. 3 mm. long. Black; the following stramineous: mandibles except for rufous apices, palpi, clypeus apically, scapes, pronotum dorsally and the tubercles, fore femora distally and beneath, middle and hind femora narrowly annulate at apex, all tibiae and tarsi, outer margins of tegulae, and inner margins of squamae. Pedicel and flagellum fuscous above, sordid eburnostramineous beneath. Clypeal bevel and caudal margins of abdominal tergites testaceous. Tegulae, outer margins of squamae, and mucro translucent hyaline. Wings clear hyaline, iridescent; stigma and veins fulvous.

Head fulgid, suborbicular in anterior aspect, slightly wider than long; clypeus and front clothed with dense appressed silvery pile, the latter with two glabrous nitidous stripes converging discally from the antennal sockets; vertex relatively glabrous; temples with fine appressed silvery pubescence; post-temporal region glabrous. Front flat, with fine close puncturation obscured by the silvery pile; width at distal end of scapes one-half the length of the eyes; with an inconspicuous impressed median longitudinal line above from the anterior ocellus; inner orbits strongly divergent above and with a broad shallow arcuate sulcus paralleling the upper inner orbits

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[44] *Cf.* Proc. Acad. Nat. Sci. Phila., LV, p. 17, (1903); *v. et.*: Idem, LXI, p. 112, (1909).

there. Vertex perfulgid, with sparse scattered puncturation; with a transverse elongate glabrous nitidous protuberant callosity behind each eye; ocelli large, their diameter subequal to the ocellocular line, situated in a curved line, the postocellar line about four times the length of the ocellocular line, from the outer hind margins of the posterior ocelli with a strong and deeply impressed narrow sulcus running obliquely forward almost to the dorsal margins of the inner orbits; occiput coarsely striatopunctate. Temples normal, moderate, about two-fifths as deep as the length of the eye, striatopunctate; temporal carinae present and well developed, and a few temporal ammochaetae present; post-temporal region nitidous. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus about twice as far from each other as from the nearest eye margin; scape straight, subcylindrical to inconspicuously obterete, one-half the length of the eye; pedicel obterete, subequal in length to the first two flagellar articles combined; flagellum filiform to inconspicuously subclavate distad, finely puberulent, first segment as broad as long, the remaining articles a little broader than long except the last which is simple, terete, and subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, flat laterally to gently tumid discally; length medially one-fifth that of eye; produced medio-apically into a short broad subtruncate lobe, the apical margin of which is gently arcuate, glabrous, nitidous and weakly bevelate. Mandibles simple, falcate, acuminate; inner margin with a small low obtuse tooth medially; lower margin very inconspicuously subemarginate medially and provided with a few ammochaetae.

Thorax fulgid; with short sparse suberect puberulent silvery pubescence dorsally; mesopleura and venter with appressed silvery pubescence. Pronotum narrow, transverse, linear, with moderate separated puncturation; dorsal surface weakly notched medially; anterior dorsal margin and lateral angles rounded and vertically declivous to neck; anterior surface strongly and irregularly lineate. Mesonotum with separated moderately fine puncturation; anterior fourth with an inconspicuous double line medially and posterior eighth with a low median longitudinal carinule; suture between mesonotum and scutellum deeply impressed and foveolate; scutellum semicircular, gently tumid, punctured like mesonotum but more sparsely so, with a faint trace of a low indistinct median longitudinal carinula discally, laterally with narrow laminate translucent margins; postscutellum flat, transverse, linear, subrectangular, one-fourth the length of the scutellum. Squamae lateral in position, flat, subfalcate, one half the length of the scutellum. Mucro straight, acuminate, canalicuate above, one-half the length of the scutellum, apex entire, obtuse. Mesopleura with a moderately fine well separated puncturation obscured by the pubescence; prepectus anteriorly with an epicnemium; episternal suture and hypersternaulus well impressed and foveolate, the mesopleural pit distinct and strongly impressed; metapleura glabrous, perfulgid, horizontally striate. Propodeum subfulgid, glabrous, finely favose basically; dorsal face with each side bisected by an oblique carinule emanating from the dorsolateral angles of the discal areole of the posterior face, and distolaterad of this carinule concave and traversed by oblique subparallel rugulae; posterior face separated from dorsal face by an transverse obquadricrenate carinule, and medially with an elevated nitidous kite-shaped area containing an elongate obpyriform fovea, the lateral areas traversed by irregular horizontal rugulae; lateral carinae well developed, sublaminate above, bifid ventrally below; lateral faces subnitidous anteriorly to microscopically favose posteriorly.

Fore coxae simple, not sulcate anteriorly; fore tarsi without traces of a pecten. Middle and hind tibiae strongly spined on outer margin. Calcaral furrow of middle tibiae not apparent. Hind femora very weakly bowed, the genicular area moderately carinate above but without any trace of fornication.

Abdomen subopaque; strongly constricted between the first and second segments, moderately so between the remainder; sparsely clothed with appressed silvery puberulent pile. Tergites with separated acupuncturation; first tergite with a strong median longitudinal furrow on basal half; last tergite with a distinct trapeziform pygidium, the disc fulgid and with scattered coarse setigerous punctures, the apex gently arcuate. Sternites with very fine well separated setigerous acupuncturation, the hypopygium flat, punctate throughout, the apex truncate to gently arcuate.

Allotype.— ♀; Topotypical, same data as type. [Academy of Natural Sciences of Philadelphia.]

Female. 3.25 mm. long. Resembles the male (type) in all essential features of livery and structure except as follows:

Psammophore well developed, with clypeal, mandibular, temporal, trochanteral and femoral ammochaetae present. Fore tarsi with a well developed pecten.

Abdomen with the third, fourth and fifth tergites hispidulous apically, as is also the disc of the pygidium which is subequilaterally triangular, with the lateral margins weakly sinuous and the disc fulgid and provided with very coarse scattered setigerous punctures.

Paratypes.—58; 50 males, 8 females, as follows:

NEW MEXICO: Alamogordo, Otero County; elevation, 4320-4600 feet; May 3 to 6, 1902; (H. L. Viereck); 36 ♂, 6 ♀; [A.N.S.P.].

CALIFORNIA: Cronise, Mohave Desert, San Bernardino County; July 9, 1938; (P. H. Timberlake; on *Chilopsidis linearis* [Desert Willow]); 1 ♂; [Timberlake]. Baldy Mesa, Mohave Desert, San Bernardino County; elevation about 3500 feet; July 21, 1936; (P. H. Timberlake; on *Lepidospartum squamatum* [Scale Broom]); 1 ♀; [Timberlake]. Little Rock, Mohave Desert, Los

Angeles County; elevation 2800-2900 feet; August 14, 1927; (J. C. Bradley); 13 ♂, 1 ♀; [Cornell].

Variation.—Aside from minor variations in the extent of the stramineous markings, the livery is much the same in all the specimens of *vierecki* examined. A female from Little Rock in the Mohave Desert shows a slight tendency toward erythrization of the abdomen and propodeum, but this scarcely progresses beyond the stage of these parts becoming light brunneous. The southern Californian specimens have a slightly more subtile puncturation than the topotypical ones from New Mexico. Otherwise there is a striking uniformity of livery and structural detail in all the material of this rather common and widespread form.

Distribution.—This xerothermal form is largely, if not entirely, confined to the Lower Sonoran zone of the southwestern United States, ranging from the western foothills of the Sacramento Mountains and the upper Rio Grande valley in south-central New Mexico westward into the Mohave Desert of California. The absence of any records from the intervening southern Arizona highlands is undoubtedly due to insufficient collecting of these forms in that area. The species is apparently widespread throughout the Mohave Desert, ranging as far west as Little Rock in the Antelope Valley; the Tehachapi Mountains and the San Gabriel and San Bernardino Ranges probably mark the respective western and southern limits of its distribution in that area. In the Mohave Desert, *vierecki* flies from early in July until the middle or latter part of August, but in southern New Mexico, it has been taken so far only in the first two weeks of May.

Belomicrus sechi[45] new species (Pl. I, figs. 14, 24; pl. II, fig. 44.)

The small size, the red abdomen, the shape of the squamae and the presence of postocular tubercles cause this species to superficially resemble the nominate form of *cladothricis*. However, the anterior surface of the fore coxae of the present species lacks the broad oblique sulcus which is so characteristic of the males of that species and its close relatives; in *sechi* the fore coxae are flatly convex anteriorly, although the outer face is furnished laterally with a weak furrow which is somewhat comparable to that borne by *cladothricis* on its anterior surface. The clypeal disc of *sechi* is weakly elevated into a flat subcampanulate platform and the apical margin of the median lobe is obscurely subbevelate, whereas in *cladothricis* and its allies, this area is distinctly tumid or even tuberculate while the median lobe of the clypeus is obviously bevelate apically.

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[45] After a former Cahuilla site north of Palm Springs in southern California.

The angustate to strongly swollen antennal scapes and the extraordinarily short interantennal distance, which serve as the most distinctive diagnostic features of *sechi,* will differentiate the present form from all other known species of *Belomicrus* in the Nearctic region.

Type.—♂; Colorado Desert, six miles north of Palm Springs, Riverside County, California. June 8, 1930. (P. H. Timberlake; on *Eriogonum trichopes.*) [Academy of Natural Sciences of Philadelphia, Type no. 10560.]

Male. 2.25 mm. long. Black: the following stramineous: mandibles save for the rufous apices, pronotum medially and tubercles, tegulae with a discal spot, axillary sclerites along outer margin, fore femora except for a wide castaneous vitta dorsally, middle and hind femora at apex, and fore, middle and hind tibiae entirely except for an elongate badeous spot on flexor surface, all metatarsi, squamae along inner margins, and mucro with an axial line. Scape and pedicel croceous. Tarsi with four distal segments sordid luteous. Outer margins of squamae and mucro, pellucid. Clypeus apically, particularly the median lobe, badeous. Trochanters and femora exclusive of stramineous maculations, castaneous. Abdomen with first two segments bright ferruginous, the following two infuscated, the remainder fuscous. Wings clear hyaline, iridescent; stigma and venation fulvous.

Head subquadrate in anterior aspect; front and clypeus clothed with dense appressed silvery pile; vertex relatively glabrous; temples with fine appressed silvery pubescence. Front with fine close puncturation obscured by the silvery pile; width at distal end of scapes about two-thirds (.65) the length of eye; from anterior ocellus with a median longitudinal sulcus, on each side of which is a slightly arcuate torus. Vertex subfulgid, with fine, close puncturation; behind each compound eye with an acute compressed longitudinal tubercle; ocelli large, situated in a very low triangle, the postocellar distance three times the length of the ocellocular line, from outer posterior margins of hind ocelli an indistinct furrow runs obliquely forward to dorsal margins of eyes. Temples normal, moderate; temporal carinae wanting; temples and post-temporal region finely punctate throughout. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus, eight-tenths as far from each other as from the nearest eye margin; scapes abruptly angustate to strongly incrassate apically, two-fifths the length of the eye; pedicel somewhat obterete, three-fourths the length of the first two flagellar articles combined; flagellum finely puberulent, about twice as long as the scape, inconspicuously incrassate distad, all but the last segment broader than long and not rounded out beneath, the ultimate article simple, terete, subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, flat, length medially one-fifth that of eye; produced medio-apically into a short broad subrectangular lobe, the apical margin of which is subtruncate to gently arcuate and glabrous, nitidous and obscurely subbevelate, the disc weakly elevated into a flat subcampanulate platform. Mandibles simple, falcate, acuminate; inner margin with a small low obtuse tooth medially; lower margin simple, arcuate, not excised.

Thorax with appressed silvery pile dorsally and on mesopleura and venter. Pronotum narrow, linear, transverse, with fine acupuncturation, dorsal surface notched medially, anterior margin and lateral angles rounded and vertically declivous, the anterior surface finely and longitudinally lineate. Mesonotum with fine moderate puncturation, anterior fourth with a fine impressed double line medially; suture between mesonotum and scutellum deeply impressed and simple; scutellum gently tumid, punctured like mesonotum, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, transverse, rectangular, one-third the length of the scutellum. Squamae lateral in position, flat, subreniform, the apices strongly incurved and bluntly rounded. Mucro straight, acuminate, apex narrowly truncate, canaliculate above, length two-thirds that of the scutellum. Mesopleura with fine puncturation obscured by the pubescence, rounded anteriorly and with a trace of a weak epicnemium above on the prepectus; episternal suture, hypersternaulus, and mesopleural pit distinctly impressed. Metapleura glabrous, subfulgid, and horizontally striate. Propodeum subfulgid, surface sculpture finely favose basically throughout; dorsal face adjacent to the lateral carinae shallowly concave, traversed by oblique lineations, and with appressed silvery pile, otherwise glabrous; posterior face glabrous, the lateral areas shallowly concave and traversed by fine irregular horizontal rugulae, the discal areole cuneate-obpyriform; lateral carinae well developed for their entire length, indistincly forked below; lateral faces glabrous, finely favose.

Fore coxae with anterior surface flatly convex, not sulcate, but with a moderate shallow groove laterally on outer faces; fore metatarsi without a pecten. Middle and hind tibiae spined on outer margin; hind femora very weakly bowed, the genicular area sharply carinate distally above but not fornicate there.

Abdomen subfulgid; moderately constricted between the segments; clothed with appressed silvery pubescence. Tergites with fine, close puncturation, the first with a median longitudinal sulcus on basal half; the last with a distinctly defined subquadrate pygidial area, the lateral margins of which are weakly convergent caudad, the apex subtruncate to gently arcuate, the disc with puncturation coarser and more separated than on preceding tergite. Sternites fulgid, with fine sparse acupuncturation, the hypopygium with the apex subtruncate.

Female. Unknown.

Paratypes.—2 males, as follows:

CALIFORNIA: Colorado Desert, six miles north of Palm Springs, Riverside County; June 8, 1930; (P. H. Timberlake; on *Eriogonum trichopes*); 2 ♂; [Timberlake].

Distribution.—This distinctive little aestival form is known only from the type locality situated in the more northern reaches of southern California's Colorado Desert.

Belomicrus cladothricis (Cockerell)

This and the following seven species comprise a group of more or less closely interrelated forms, the diagnostic features of which are given in the section dealing with the series and species groups of *Belomicrus.* The most outstanding character separating the members of this group, of which the present species is the nominate form, from all the preceding assemblages is the obliquely sulcate condition of the male fore coxae.

From the last four species of the Cladothricis Group—*istam, tuktum, mescalero* and *timberlakei*—, the present species is distinguished by a variable number of features, the most distinctive and constant of which is the greater interantennal-antennocular ratio. In this respect, *cladothricis* agrees with the following three forms: *pachappa, cucamonga* and *minidoka.* But the squamae of *minidoka* and *cucamonga* are semicircular or semilunate and the postocellar line is but three times the length of the ocellocular distance, whereas in *cladothricis* the squamae are more or less reniform and the postocellar distance is fully four times the length of the ocellocular line; moreover, as noted in the following descriptions, the structure of the clypeus, the facies of the abdomen, and the puncturation of the body of the former two species are quite different from those of the present form. The differential features distinguishing *cladothricis* from its closest North American congener *pachappa,* are given in the introductory discussion of that species on a following page.

The present species breaks up into three races: two well marked aestival to autumnal subspecies, and one rather weakly defined vernal form. These races are differentiated and discussed separately below.

Belomicrus cladothricis cladothricis (Cockerell)
(Pl. I, fig. 12; pl. II, figs. 33, 35.)

Oxybelus cladothricis Cockerell, Canad. Entom., XXVII, p. 309, (1895); [♀, ♂; Las Cruces, New Mexico].—Cresson, Mem. Amer. Ent. Soc., no. 5, p. 53, (1928); [♂ (recte ♀); lectotype designated].

Belomicrus cladothricis Ashmead, Canad. Entom., XXXI, p. 162, (1899).—Rohwer & Cockerell, Ent. News, XIX, p. 180, (1908); [on *Croton*; between Rowe and Old Pecos Pueblo, San Miguel County, New Mexico]. — ? Baker, Pomona Coll. Journ. Ent., I, p. 30, (1909); [Claremont, California; cf. *serrano serrano*].—Kohl, Konowia, II, p. 270, (1923).

The typical subspecies of *cladothricis* is a rather fulgid, aestival to autumnal form, widely distributed throughout the Lower Sonoran Zone of the southwestern states, and distinguished by its relatively slender mucro and moderately incurved subreniform squamae. The puncturation of the body is moderately fine with the individual punctures distinctly separated. In the male sex, the clypeus is strongly but not sharply tumid and punctate discally, while the median lobe terminates in a transverse sublinear, glabrous and nitidous bevel; the clypeus of the females on the other hand is elevated discally into a subcampanulate platform which is glabrous, nitidous and gently declivous to the apical margin of the median lobe but not provided with a distinct bevel as in the males.

In the Upper Sonoran and Transitions Zones of the Transverse Ranges, the Coast Ranges and adjacent regions of southern California occurs a dull, lustreless form separable from the nominate race by a relatively broad mucro and wider, more strongly incurved squamae. Moreover, the vertex, mesonotum and abdomen of this subspecies, to which the name *eriogoni* is applied on a following page, are covered with strong, very close, contiguous punctures. Like the typical race, *eriogoni* is an aestival to autumnal form with the clypeal structure similar to that of the nominate subspecies.

Existing in the Colorado Desert and neighbouring areas of southern California is an early vernal to aestival population of *cladothricis* which displays a somewhat intangible but rather different facies in comparison with the preceding two aestival and autumnal races. The structure of the mucro and squamae and the puncturation of the body are very similar to that of the nominate race, although based on the whole on a finer pattern. Moreover, the front of the present race is appreciably broader than that of either of the two preceding forms. Furthermore, the clypeus of the males is rather sharply and trigonally tumid and furnished medio-apically with a flat triangular, glabrous, nitidous, gently declivent platform; the clypeal structure of the females is rather similar to but not as clearly defined as in the opposite sex. This subspecies, denominated *prosopidis* on a following page, is admittedly the most poorly demarcated of the three races of *cladothricis*. It is clearly evident that much more material of this race, as well as of the typical *cladothricis*, is needed in order to define more clearly the differential characters and plot more accurately the ranges of the various subspecies of *cladothricis*, the nominate form of which is herewith redescribed.

Lectotype.— ♀ ; Las Cruces, Doña Ana County, New Mexico. Elevation, 3883 feet. "Early in September, 1895." (T. D. A. Cockerell; on *Cladothrix cryptantha.*) [Academy of Natural Sciences of Philadelphia, Type no. 10024.]

Female. 3 mm. long. Black; the following stramineous: mandibles except for the stramineous apices, scape, pedicel, pronotum, the tubercles, axillary sclerites, postscutellum, inner margins of squamae, mucro medially, fore femora apically and beneath, and all tibiae and tarsi. Apical margin of clypeal lobe, flagellum, and all femora, fulvous. Tegulae clear hyaline with a fulvous tint. Squamae and mucro with outer margins pellucid. Wings clear hyaline, iridescent; stigma and veins brunneous.

Head subfulgid, subquadrate, slightly longer than broad in anterior aspect; front with lower two-thirds of inner orbits and clypeus, save for the glabrous disc, heavily clothed with appressed flattened silvery pile; front medially and vertex with more inconspicuous short suberect pubescence; temples moderately clothed throughout with short appressed silvery pubescence. Front with fine moderate rather close puncturation; width at distal end of scapes one-half the vertical length of eye; inner orbits rather strongly divergent above and mesad of each on lower two-thirds with a broad and very shallow furrow paralleling their inner margins, upper two-thirds of front weakly tumid discally and bisected medially by a weak vertical furrow emanating from the anterior ocellus. Vertex fulgid, with puncturation like that of front; with a small but distinct, strongly compressed tubercle behind each compound eye; ocelli moderately large, situated in a curved line, the postocellar distance four times the length of the ocellocular line, from outer margins of hind ocelli with a narrow strongly impressed furrow running obliquely forward to dorsal margins of inner orbits. Temples normal, moderately punctate like vertex throughout; temporal carinae wanting; temporal ammochaetae well developed; post-temporal region glabrous and nitidous. Antennae short, barely reaching occiput, situated low on face on dorsal margin of clypeus twice as far from each other as from nearest eye margin; scape straight to inconspicuously obterete, four-tenths the length of eye; pedicel subcylindrical, subequal in length to first flagellar article; flagellum finely puberulent, first two segments subequal in length, last article simple, terete, subequal in length to two preceding segments combined. Clypeus transverse, subfusiform; medial length about one-fifth that of eye; flat laterally to strongly tumid discally where it is elevated into a low indistinct subcampanulate platform which is glabrous, nitidous, and gently declivent to the short produced median lobe, the apical width of which is one and one-third the median length of clypeus, apical margin of lobe subtruncate to gently, convexly arcuate distad, no distinct bevel present. Mandibles subfalcate, apices acuminate, inner margins medially with a blunt tooth, lower margins entire, arcuate, and provided with long ammochaetae.

Thorax more or less fulgid; pronotum, posterior margin of mesonotum, the squamae and mesopleura rather thinly clothed with more or less appressed silvery pubescence; mesonotum with short, inconspicuous, suberect subaeneous pile. Pronotum narrow, transverse, indistinctly notched medio-dorsally, with fine acupuncturation, the anterior declivent surface rather strongly, longitudinally lineate, anterior dorsal margin and lateral angles rounded and declivent. Mesonotum with fine distinctly separated punctures superposed on a microscopic clathrate lineation, anterior third with a fine double longitudinal line medially; suture between mesonotum and scutellum distinctly impressed, simple; scutellum subsemicircular, gently tumid, punctured like mesonotum, ecarinate medially, laterally with narrow laminate margins; postscutellum flat, finely punctate, narrow and transversely subrectangular, one-fourth the length of scutellum, posterior margin straight. Squamae large, flat, subreniform, situated laterally, rather strongly incurved behind but not ampliate distad, the apices entire, bluntly rounded to subtruncate. Mucro straight, acuminate, finely canaliculate above, one-half the length of scutellum. Mesopleura punctured like mesonotum, rounded anteriorly and without an epicnemium, episternal suture strongly impressed especially above, hypersternauli more or less obsolescent, mesopleural pit distinctly impressed. Metapleura glabrous, subfulgid, with fine horizontal striae. Propodeum glabrous, subopaque, basally with a microscopic favose sculpture; dorsal face with outer half of each lateral area concave and traversed by fine oblique subparallel carinulae; posterior face with discal areole obcuneate in shape and with a few horizontal indistinct rugulae within; lateral carinae well developed for entire length, sublaminate and fornicate medially; lateral faces subfulgid.

Fore legs with coxae simple; humeral and femoral ammochaetae present; tarsi with a distinct pecten. Middle and hind tibiae moderately spinose on outer margins; calcaral furrow of middle tibiae well developed. Hind femora moderately bowed, the genicular carina extending along distal half of dorsal surface and moderately fornicate apically.

Abdomen fulgid; moderately constricted between the segments; thinly clothed dorsally with appressed silvery pile which is most noticeable along apical margins of tergites. Tergites with a very fine well separated acupuncturation superposed on a microscopic clathrate lineation. Sternites with a finer, sparser puncturation than tergites. Pygidium subequilaterally trigonal, the disc perfulgid and with a few scattered, rather coarse setigerous punctures.

Allodigm.— ♂; Hodge, Mohave Desert, San Bernardino County, California. September 14, 1935. (P. H. Timberlake; on *Cleomella obtusifolia* [Mohave Stinkweed].) [Academy of Natural Sciences of Philadelphia.]

Male. 3 mm. long. Resembles the female (type) in all essential details of livery and structure except as follows:

Flagellum, pronotum and postscutellum, black. Apical abdominal tergites brunneous.

Clypeus tumid, punctate and pubescent discally, the median lobe distally with a nitidous, glabrous, narrow transverse sublinear to subelliptical bevel the upper edge of which is at most submarginate. Temporal ammochaetae absent.

Thorax in general same as female but punctures of mesonotum somewhat larger and more separated.

Fore coxae strongly sulcate anteriorly; ammochaetae absent; no pecten on tarsi.

Abdomen as in female but last tergite with a subquadrate pygidium the disc of which is perfulgid and bears a few coarse scattered setigerous punctures.

Remarks.—The original material upon which Cockerell based his description of *cladothricis* apparently comprised both sexes, but how many specimens were represented in his type series is unknown to me. In 1928, Cresson, in selecting a lectotype of Cockerell's *cladothricis*,[46] inadvertently stated that the type specimen chosen was a male, but examination of it has revealed it to be a female. I have no information what has become of the male specimen described by Cockerell, nor of the remainder of the type series if such existed. No males have been represented in any of the small lots of *cladothricis* from New Mexico that I have examined. Consequently, I have based by description of the male sex of the nominate race upon a specimen from Hodge, California, which was taken together with females that agree in all essential respects with the lectotype. It is obvious that more topotypic material of the nominate race is needed.

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[46] Mem. Amer. Ent. Soc., no. 5, p. 53, (1928).

Baker in 1909 reported *cladothricis* as common about Claremont, California,[47] during the early spring, but these specimens in all probability were the typical race of *serrano* as I have pointed out on a foregoing page under the discussion of that species.

Variation.—The nominate race of *cladothricis* as a rule is a form well maculated with yellow and with the entire abdomen bright ferruginous. Often, however, specimens occur with the apical abdominal tergites infuscated or even dark brunneous while the yellow markings on the pronotum, postscutellum and legs may be greatly reduced in extent if not at times altogether wanting. The punctures of the head, thorax and abdomen are typically superposed upon a microscopic clathrate lineation, but this latter at times is obsolescent or even wanting as in the material from Cushenbury Springs in California; on the other hand the lineation may be appreciably coarsened as in certain specimens from northwestern Nevada and the Upper Owens Valley of California. Furthermore, an occasional Californian female specimen may show a very faint trace or rudiment of a semielliptical bevel on the distal margin of the median clypeal lobe. Material from the more arid regions of Nevada and the Mohave Desert have a heavier clothing of silvery pile than those from the less xeric areas; the former likewise usually display the fullest and most brilliant livery.

Specimens examined: 70; 22 females, 58 males, as follows:

NEW MEXICO: Six miles northeast of Embudo, Rio Arriba County; August 25, 1931; (P. H. Timberlake; at flowers of *Croton*); 1♀; [Timberlake]. Las Cruces, Doña Ana County; elevation, 3883 feet; "early in September, 1895"; (T. D. A. Cockerell; on *Cladothrix cryptantha*); 1♀; [*type*, A.N.S.P.]

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[47] Pomona Coll. Journ. Ent., I, p. 30, (1909).

NEVADA: Vya, Washoe County; July 7, 1927; (J. C. Bradley); 1♀; [Cornell].

CALIFORNIA: Mammoth Lakes, Mono County; July 23, 1936; (R. M. Bohart); 1♂; [Bohart]. Clark Mountain,[48] San Bernardino County; elevation, 4500 feet; July 7, 1938; (P. H. Timberlake; on *Eriogonum inflatum* [Desert Trumpet]); 1♀; [Timberlake]. Black Canyon,[49] Mohave Desert, San Bernardino County; October 7, 1928; (P. H. Timberlake; on *Lepidospartum squamatum* [Scale-broom]); 1♀; [Timberlake]. Hodge, San Bernardino County; September 14, 1935; (P. H. Timberlake; on *Cleomella obtusifolia* [Mohave Stinkweed]); 2♀, 2♂; [Timberlake]. Cushenbury Springs,[50] San Bernardino County; elevation, 4000 feet; September 1, 1936; (P. H. Timberlake; on *Lepidospartum squamatum*); 11♀, 45♂; [Timberlake]. Morongo Valley,[51] San Bernardino County; October 5, 1934; (P. H. Timberlake; on *Eriogonum nodosum* and *Gutierrezia lucida* [Snakeweed]); 3♀; [Timberlake]. Mission Canyon,[52] San Bernardino County; October 1, 1932; (P. H. Timberlake; on *Lepidospartum*); 1♀; [Timberlake].

Distribution.—The nominate race of *cladothricis* is a xerothermal form, primarily eremian in distribution. It occurs throughout the Lower Sonoran Zone of the southwestern United States, flying as a rule from early or middle summer well into the fall. The range of the present subspecies extends from the western flanks of the Organ, San Andreas, Manzano, and Sangre de Cristo Ranges of the Upper Rio Grande Valley in central New Mexico, westward across the Arizona highlands and well into and throughout the Mohave Desert in California, thence northward via the Owens Valley and the Smoke Creek Desert into the arid northwestern corner of Nevada just east of the Warner Mountains. The absence of any records from Arizona[53] and the Nevada basins, where is indubitably occurs, is probably due to insufficient collecting of these tiny forms in those areas.

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[48] Not to be confused with Clark Mountain in the Yosemite National Park, Mariposa County, California. The present Clark Mountain, some 7000 feet high, is situated in the Upper Kingston Valley in the northeastern part of San Bernardino County and lies about midway between the Kingston Range on the north and the Ivanpah Mountains to the south. [*Cf.* U. S. Geol. Surv. Water-Supply Pap., no. 578, pp. 599-604, pl. 12, (1929); *v. et.*: U. S. Geol. Surv. Water-Supply Pap., no. 224, map, pl. 1, (1909).]

[49] Black Canyon, in the Mohave Desert, lies just west of Black Mountain and about fifteen miles almost due north of Hinckley. [*Cf.* U. S. Geol. Surv. Water-Supply Pap., no. 578, map, pl. 10, (1929).]

[50] *Cf.* Grinnell [1908, Univ. Calif. Publ. Zool., v, p. 21] for a description of this locality.

[51] *Cf.* U. S. Geol. Surv. Water-Supply Pap., no. 578, pp. 641-642, pl. 11, (1929).

[52] This I presume is the canyon of Mission Creek which lies between the canyon of Whitewater River to the west and Dry Morongo and Big Morongo Creeks to the east; all of these drain the southeastern flanks of the San Bernardino Mountains in the vicinity of Mt. San Gorgonio, eventually flowing into the Colorado Desert.

In the cooler, more humid Upper Sonoran and Transition Zones of the San Bernardino, San Gabriel and Coast Ranges district of California, the typical subspecies of *cladothricis* is replaced by the following interesting and distinctive race, *cladothricis eriogoni.*

Belomicrus cladothricis eriogoni[54] new subspecies (Pl. I, fig. 11.)

The differential features distinguishing this geographic race from the nominate subspecies have been presented on a foregoing page in the introductory discussion of the typical *cladothricis.*

Type.—♂; San Lucas, Monterey County, California. August 20, 1935. (P. H. Timberlake; on *Eriogonum gracile.*) [Academy of Natural Sciences of Philadelphia, Type no. 10561.]

Male. 3 mm. long. The following description is largely comparative with that of the preceding typical (or nominate) form of *cladothricis* and stresses solely those characters showing sufficient difference worthy of being noted.

Black; the following deep stramineous: mandibles except the dark rufous apices, scape, tubercles, squamae and mucro except for their outer pellucid margins, fore femora apically and beneath, and all tibiae with a line on their extensor surfaces. Median lobe of clypeus fulvous apically. Pedicel and scape dilute brunneous above, sordid fulvous beneath. Legs exclusive of yellow maculation bright fulvoferruginous. Tegulae and axillary sclerites dark castaneous. Abdomen bright ferruginous, the apical tergites somewhat infuscate.

Head, thorax, and abdominal tergites with fine close contiguous punctures rendering the surface more or less opaque. Post-temporal region of head distinctly punctate and puberulent. Squamae broader, the apices bluntly truncate. Mucro broad, almost one-half as wide as long, the apex subtruncate. Fore femora broader and with a more distinct furrow on flexor surface for the reception of tibiae.

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[53] Many years ago, I examined a pair of specimens taken by Dr. F. X. Williams at Tucson, Arizona, on May 30, 1920, which I believed at that time to be *Belomicrus cladothricis.* These are no longer before me, but I am now inclined to believe that they were material of the vernal form described as *mescalero* on a following page.

[54] After the genus of plants (i. e. *Eriogonum*) at whose flowers this as well as many other forms of *Belomicrus* occur.

Allotype.—♀; Topotypical; same data as type. [Academy of Natural Sciences of Philadelphia.]

Female. 3 mm. long. Similar to the male (type) except in the following details.

Livery in general the same but abdomen wholly bright ferruginous.

Squamae apparently somewhat broader, the apices squarely truncate. Psammophore with the mandibular, temporal, humeral, trochanteral, and femoral ammochaetae well developed. Pygidium trigonal, the apex more broadly rounded and the disc usually with closer and coarser punctures than in the typical subspecies.

Paratypes.—18; 10 males, 8 females, as follows:

CALIFORNIA: San Lucas, Monterey County; August 20, 1935; (P. H. Timberlake; on *Eriogonum gracile*); 4 ♂. Mohave River at Deep Creek, San Bernardino Mountains, San Bernardino County; August 14, 1936; (P. H. Timberlake; on *Eriogonum mohavense*); 1 ♂, 1 ♀. Big Bear Valley, San Bernardino Mountains, San Bernardino County; August 11, 1933 and September 14, 1934; (P. H. Timberlake; on *Eriogonum Wrightii* var. *subscaposum*); 3 ♀. Mill Creek, San Bernardino Mountains, San Bernardino County; elevation, 6000 feet; June 26, 1938; (P. H. Timberlake; on *Rhamnus californica* [Coffeeberry]); 1 ♂. Valley of the Falls,[55] San Bernardino County; September 7, 1935; (P. H. Timberlake; on *Eriogonum Wrightii* var. *subscaposum*); 1 ♂. Riverside, Riverside County; May 13 to September 12, 1929-33; (P. H. Timberlake; on *Eriogonum gracile, Croton californicus*, and *Euphorbia albomarginata* [Rattlesnake weed]); 2 ♂, 4 ♀. Whitewater Canyon, Riverside County; September 11, 1935; (P. H. Timberlake; on *Eriogonum gracile*); 1 ♀. [All Timberlake.]

The paratypic specimens agree with the types in all essential details of livery and structure.

Distribution.—Like the nominate race, *eriogoni* is largely an aestival and autumnal form, but in comparison with the typical subspecies, the present race appears to be primarily an inhabitant of the cooler, more humid Upper Sonoran and lower Transition Zones of the montane and piedmont areas centering around the San Bernardino, San Gabriel, and Coast Ranges of southern

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[55] The Valley of the Falls is the upper portion of Mill Creek, situated just southwest of Mt. San Gorgonio.

California. The ranges of *cladothricis cladothricis* and *cladothricis eriogoni* afford an interesting analogy and parallel to the distribution of the minute Pemphredonid *Timberlakena nolcha* and its atypical race *hualga,*[56] which occupies much the same territory and is often taken with *eriogoni.*

Belomicrus cladothricis prosopidis[57] new subspecies
(Pl. I, fig. 10; pl. II, fig. 34.)

The diagnostic characters separating the present race from the typical subspecies have been presented on a foregoing page in the introductory discussion of the nominate form of *cladothricis.*

Type.—♂; Palm Springs, Riverside County, California. April 10, 1932. (P. H. Timberlake; on *Prosopis chilensis* [Mesquite].) [Academy of Natural Sciences of Philadelphia, Type no. 10562.]

Male. 2.5 mm. long. Agrees with the allodigm of the typical subspecies in all essential details, except in the following noteworthy features.

The following stramineous: scapes entirely, pronotum dorsally to and including the tubercles, tibiae largely, and tarsi entirely. Flagellum and pedicel fulvous beneath, dilute brunneous above. Tegulae and axillary sclerites fulvous. Abdomen with only first segment ferruginous, the remainder brunnescent to black.

Head with puncturation similar to that of typical *cladothricis* but in general somewhat finer. Width of front at distal end of scapes five-eighths (.63) the vertical length of eye. Clypeus with distal margin of median lobe terminating in a glabrous, nitidous, low trigonal bevel, the dorsal margin of which is rather sharp and distinct. Post-temporal region of head fulgid and with fine acupuncturation.

Thorax fulgid, with puncturation similar to that of typical race but finer. Pronotum strongly notched medio-dorsally. Squamae moderately incurved behind, the apices rounded. Mucro acerose.

Abdomen fulgid; tergites more finely punctate, the sternite more distinctly and coarsely punctate than in nominate race.

Allotype.—♀; Palm Springs, Riverside County, California. May 11, 1935. (P. H. Timberlake; on *Eriogonum pusillum.*) [Academy of Natural Sciences of Philadelphia.]

Female. 2.5 mm. long. Agrees with the diagnosis of the male (type) except in the following details:

Abdomen bright ferruginous throughout. Femora brunneous.

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[56] *Cf.* Trans. Amer. Ent. Soc., LXIV, pp. 385-388, (1939).

[57] After the mesquite plant (*Prosopis chilensis*) upon which a number of the type series of this race were taken.

Head, thorax and abdomen subfulgid, with slightly coarser, closer punctures. Clypeal structure rather similar to that of typical race. Squamae somewhat more strongly incurved behind. Propodeum more delicately sculptured.

Paratypes.—16; 13 males, 3 females, as follows:

CALIFORNIA: Palm Springs, Riverside County; April 9-10, 1932; (P. H. Timberlake; on *Prosopis chilensis* [mesquite]); 4 ♂ ; [Timberlake]. Andreas Canyon, near Palm Springs, Riverside County; April 24, 1932; (P. H. Timberlake; on *Eriogonum fasciculatum* var. *polifolium*) ; 1 ♀ ; [Timberlake]. Experiment Farm, Imperial County; April, 1911 and June, 1912; (J. C. Bridwell) ; 6 ♂ , 1 ♀ ; [U.S.N.M.]. Yuma Indian Reservation (across Colorado River from Yuma, Arizona), Imperial County; May 3-5, 1918; (J. C. Bradley; swept from flowers of composite along bank of river at end of railroad bridge); 2 ♂ , 1 ♀ ; [Cornell]. Needles, San Bernardino County; April 1-7, 1918; (J. C. Bradley) ; 1 ♂ ; [Cornell].

Variation.—The livery of the specimens from Imperial County is on the whole brighter, and more extensive, while the puncturation is finer than that exhibited by the topotypic material. The female from San Andreas Canyon probably should not be considered paratypic, for it is an intermediate type; the puncturation of the head and abdomen and the structure of the squamae and mucro approach the condition characteristic of the preceding montane race, *eriogoni*, but the thorax is more reminiscent of that of the typical race while the relative proportions of the head, particularly the width of the front, is intermediate between that of *prosopidis* and the typical *cladothricis*. The material from the region of the Colorado River (Needles and the Yuma Indian Reservation) is inclined to be melanistic.

Distribution. — In contradistinction to the two preceding aestival and autumnal subspecies, *prosopidis* is primarily a vernal race, rather widely distributed throughout the Colorado Desert, the Imperial Valley and the riparian regions of the lower Colorado River.

Belomicrus pachappa[58] new species (Pl. I, fig. 8; pl. II, fig. 37.)

Very closely related to the preceding species, *pachappa* may be distinguished from *cladothricis* by its broad stocky appearance and the shape of the squamae which in the present form are somewhat ampliate distad with the apices broadly truncate and notched. Moreover, in *pachappa* the lower portion of the temples is glabrous and nitidous while the median lobe of the clypeus is quite broad and terminates in a narrow transverse linear bevel, whereas in *cladothricis* the temples are usually distinctly punctate and pubescent throughout and the median lobe of the clypeus is narrower and without a distinct linear bevel distally. Furthermore, the antennal scape of *pachappa* is appreciably shorter and the front relatively broader than is the case in *cladothricis.*

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[58] After Pachappa Hill near Riverside, California.

Type.—♀; Riverside, Riverside County, California. April 22, 1927. (P. H. Timberlake; on *Baeria chrysostoma* var. *gracilis* [Gold Fields].) [Academy of Natural Sciences of Philadelphia, Type no. 10563.]

Female. 3 mm. long. Black; the following stramineous: mandibles except for rufous apices, scape anteriorly, pronotum with a small median spot dorsally, pronotal tubercles, inner margins of squamae, fore femora apically and beneath, and all tibiae on extensor surface. The following fulvous: clypeal bevel, palpi, scape posteriorly, pedicel, flagellum basally and beneath (brunneous above), all legs distad of trochanters and exclusive of stramineous maculations. Axillary sclerites castaneous. Tegulae clear hyaline tinged with fulvous. Outer margins of squamae and distal half of mucro pellucid. Abdomen bright ferruginous. Wings clear hyaline, iridescent; stigma and veins light brunneous.

Head subfulgid, subquadrate in anterior aspect; front with lower two-thirds of inner orbits broadly, and clypeus, except for disc and the bevel, heavily clothed with appressed silvery pile; vertex with inconspicuous short suberect pubescence; temples with upper two-thirds moderately clothed with short appressed silvery pubescence. Front flat, and except for the nitidous weakly indicated antennal scrobes with fine moderately close punctures becoming closer and subcontiguous dorsad; inner orbits subparallel to somewhat divergent above, with a wide inconspicuous shallow trough paralleling their inner margins; width at distal end of scapes two-thirds the vertical length of eye; medially above with a fine inconspicuous longitudinal impressed line from anterior ocellus. Vertex subopaque, with fine close puncturation; behind each compound eye with a small sharp tubercle; ocelli large, situated in a curved line, the postocellar distance about four times the length of the ocellocular line, the hind ocelli with a slightly arcuate strongly impressed furrow running obliquely forward from their posterior lateral margins to the upper margin of the inner orbits. Temples normal, moderate, finely punctatostriate on upper two-thirds, lower third glabrous and nitidous; temporal carinae wanting; temporal ammochaetae well developed; post-temporal region glabrous, nitidous. Antennae reaching about to occiput, situated low on face on dorsal margin of clypeus twice as far from each other as from nearest eye margin; scape straight, subcylindrical, slightly ampliate medially, one-third the length of the eye; pedicel subobterete, one and one-half times the length of the first flagellar segment; flagellum finely puberulent, first two segments subequal in length and slightly longer than broad, remaining segments except last broader than long, all simple, none rounded out beneath, ultimate article simple, terete, subequal in length to two preceding segments combined. Clypeus narrow, transverse, subfusiform, median length one-fourth that of eye, flat laterally, raised discally into a glabrous, nitidous, subcampanulate platform which terminates distad in a short broad median lobe, the apical width of which is about one and one-half the median clypeal length, apical margin of lobe broadly and shallowly concavely arcuate, subapically with a narrow transverse sublinear, gently deflexed, glabrous and nitidous bevel, the dorsal edge of which is submarginate. Mandibles subfalcate, apices acute, lower margins entire, arcuate and provided with long ammochaetae.

Thorax subopaque; pronotum and mesopleura thinly clothed with appressed silvery pubescence; mesonotum and scutellum with inconspicuous suberect puberulent subaeneous pubescence. Pronotum narrow, transverse, with microscopic clathrate lineation superposed on which is a sparse and scattered series of fine punctures, dorsal surface distinctly notched medially, anterior dorsal margin and lateral angles rounded and declivent, the anterior declivous face with sparse, rather coarse longitudinal lineations. Mesonotum with a fine moderately close puncturation superposed on a microscopic clathrate lineation, anterior third with a fine double longitudinal line medially; suture between mesonotum and scutellum simple, deeply impressed, slightly widened laterally; scutellum subsemicircular, flatly tumid, punctate like mesonotum, ecarinate medially, laterally with narrow laminate margins; postscutellum flat, finely punctate, narrow and transversely subrectangular, one-fourth the length of scutellum, posterior margin straight. Squamae large, flat to slightly tilted, subreniform, situated laterally, very strongly incurved behind and somewhat ampliate distad, the apices bluntly truncate and notched. Mucro straight, acuminate, finely canaliculate above, one-half the length of scutellum. Mesopleura punctured like mesonotum, rounded anteriorly and with a trace of an epicnemium above on prepectus, episternal suture strongly impressed, hypersternauli obsolescent, mesopleural pit distinct. Metapleura glabrous, fulgid, with fine horizontal striae. Propodeum glabrous, subfulgid, basically with a microscopic favose sculpture; dorsal face with outer half of lateral areas concave and traversed by fine oblique subparallel rugulae; posterior face with a few fine subparallel horizontal rugulae laterally, the discal areole broady cuneate and subfavose within; lateral carinae well developed, sublaminate above and medially, abruptly obsolete ventrally below; lateral faces perfulgid discally and with a few fine irregular striae above.

Fore legs with coxae simple; humeral and femoral ammochaetae poorly developed; tarsi with a distinct pecten. Middle and hind tibiae moderately spinose on outer posterior faces; calcaral furrow of middle tibiae well developed. Hind femora strongly bowed, the genicular carina extending along distal half of dorsal surface and rather strongly fornicate apically.

Abdomen rather broad and flat; subfulgid to subopaque; not appreciably constricted between the segments; inconspicuously clothed with fine puberulent silvery pubescence. Tergites with a fine rather close acupuncturation superposed on a microscopic clathrate lineation; sternites with a sparse, finer setigerous puncturation than tergites; pygidium broadly trigonal, the disc perfulgid and subnitidous and provided with a number of scattered rather large and coarse setigerous punctures.

Male. Unknown.

The present species is a vernal form, known at present from only the unique female described above from the southern piedmont of the Transverse Ranges district of southern California.

Belomicrus cucamonga [59] new species (Pl. I, fig. 18; pl. II, fig. 36.)

The present species is somewhat intermediate between *cladothricis* and *minidoka,* but is separable from both by the trigonal shape of the clypeal bevel, by the poorly developed postocular tubercles, the strong constrictions between the abdominal segments, the rather convex abdominal venter, and the slightly narrower front. From *cladothricis,* it is still further distinguished by the shorter postocellar line and the sublunate squamae, agreeing in these particulars with *minidoka,* from which it may be differentiated, in addition to the characters given above, by the reddish abdomen, the closer puncturation and the comparatively poorly developed lateral propodeal carinae.

Type.—♀; Camp Baldy,[60] San Gabriel Mountains, San Bernardino County, California. August 21, 1929. (P. H. Timberlake; on *Eriogonum fasciculatum* [California Buckwheat].) [Academy of Natural Sciences of Philadelphia, Type no. 10564.]

Female. 2.5 mm. long. Black; the following stramineous: mandibles except the rufous apices, scape with a narrow longitudinal stripe anteriorly, pronotal tubercles, squamae on inner half, fore tibiae entirely, middle and

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[59] After a former Gabrieleno village, at or near the site of the present southern California town of that name.

[60] Camp Baldy is situated about ten miles north of Claremont, California, at the head of San Antonio Canyon.

hind tibiae annulate basally. The following fulvous: clypeal bevel, axillary sclerites, middle and hind tibiae apically, and all tarsi. Tegulae clear fulvous-hyaline. Squamae with outer margins, and apical half of mucro, pellucid-hyaline. Abdomen with first two segments sordid ferruginous, the third and last segments light brunneous, remainder deep fuscous. Wings clear hyaline, iridescent; stigma and veins brunneous.

Head subfulgid to subopaque, subquadrate in anterior aspect; clypeus and lower half of inner orbits clothed with dense appressed silvery pile, remainder of front and vertex with short inconspicuous suberect puberulent pubescence, temples with sparse decumbent silvery pubescence. Front entirely covered with fine rather close punctures; width at distal end of scapes somewhat more than half (.55) the vertical length of eye; lower half and inner orbits flat, tumid medially above and with a faint trace of an impressed median longitudinal line from anterior ocellus; inner orbits distinctly divergent above. Vertex with puncturation similar to that of front but with a fine microscopic clathrate lineation between the punctures; a small rather poorly developed acute fulgid tubercle behind each eye; ocelli moderate, situated in a curved line, the postocellar distance about three times the length of the ocellocular line, areas along anterior margin of median ocellus and lateral margins of hind ocelli strongly impressed, oblique ocellocular furrow almost obsolete. Temples normal, moderate, finely punctate; temporal ammochaetae present; post-temporal region glabrous, nitidous. Antennae short, reaching about to hind ocelli, situated low on face on dorsal margin of clypeus twice as far from each other as from the nearest eye margin; scape straight, subcylindrical, three-eighths the length of the eye; pedicel subcylindrical, longer than first flagellar article; flagellum finely puberulent, all but first and last segments broader than long and none rounded out beneath, the first segment a little longer than broad, the ultimate article simple, terete, subequal in length to two preceding segments combined. Clypeus transverse, subfusiform, length medially about one-fifth the length of the eye, flat laterally to rather sharply tumid discally; produced medially into a short broad subtruncate lobe, the apical width of which is twice the medial length of clypeus, the apical margin very broadly and shallowly excavate, and discally with a gently declivous, glabrous, nitidous, flat to inconspicuously concave trigonal bevel, the distolateral corners of which are acute. Mandibles subfalcate; inner margins with a blunt dentiform angle medially; lower margins simple, entire, arcuate, and with long ammochaetae.

Thorax subfulgid to subopaque; clothed with short inconspicuous puberulent pubescence which is most noticeable on pronotum and a silvery fascia along posterior margin of mesonotum, mesopleura and venter with very sparse decumbent silvery pubescence. Pronotum narrow, transverse, linear, with fine acupuncturation, dorsal surface not notched medially, anterior dorsal margin and humeral angles rounded. Mesonotum with microscopic clathrate lineation superposed on which is a series of fine moderately close punctures; no trace of a double median longitudinal line anteriorly; suture between mesonotum and scutellum simple, rather strongly impressed, and widened laterally; scutellum subsemicircular, flatly tumid, with surface sculpture similar to mesonotum, ecarinate medially, laterally with narrow laminate margins; postscutellum flat, transversely subrectangular, one-fourth the length of scutellum, finely and closely punctate, posterior margin straight. Squamae flat, lateral in position, sublunate, inner margins gently concavely arcuate, apices bluntly acute. Mucro straight, narrow, linear, apex bluntly truncate, canaliculate above, five-eighths the length of scutellum. Mesopleura with fine microscopic clathrate lineation superposed on which is a very sparse scattered series of acupunctures; rounded anteriorly, no epicnemium; episternal suture rather strongly impressed above, hypersternauli obsolescent, mesopleural pit faint; epipleura simple, the division between them and mesopleura deep. Metapleura glabrous, fulgid, with weak horizontal striae. Propodeum glabrous, subopaque, basic sculpture microscopically favose; dorsal and posterior faces with outer half of lateral areas rather flatly and abruptly depressed and traversed by fine subparallel rugulae, the discal areole of posterior face elongate, narrowly cuneate, distinctly demarcated and subnitidous within; lateral carinae well developed, but not laminate, for entire length; lateral faces fulgid anteriorly and with indistinct horizontal lineations to subopaque and simply favose posteriorly.

Fore legs with ammochaetae not apparent; the coxae simple; tarsi with a weak pecten. Middle and hind tibiae weakly spinose on extensor surface. Hind femora indistinctly bowed, almost straight, the genicular area with a weak keel dorsally, and simple, without trace of fornication distally.

Abdomen subfulgid; strongly constricted between all the segments. Tergites not very strongly flexed under at sides, with a fine microscopic clathrate lineation superposed on which is a scattered series of acupunctures; sparsely clothed with decumbent silvery pubescence; ultimate tergite with a trigonal pygidium, the disc subopaque and with fine microscopic clathrate lineation superposed on which are a few scattered coarse punctures. Sternites rather convex, fulgid, subglabrous, with very sparse scattered setigerous acupunctures.

Male. Unknown.

Paratype.—1 female, as follows:

WASHINGTON: Stratford, Grant County; elevation, 1279 feet; July 4, 1920; (R. C. Shannon); [Wash. St. Coll.].

Remarks.—The paratypic specimen from Washington, while presenting the same diagnostic features as the type, nevertheless differs from it in a few minor details. Compared with the material from the San Gabriel Range of southern California, the Stratford specimen has the abdomen more strongly infuscated, the nitidous clypeal bevel more distinctly concave, the apices of the squamae somewhat more blunt, the discal areole of the posterior propodeal face broader, the abdominal venter subopaque and more closely punctate, and the oblique ocellocular vertical furrow well developed. In view of these differences, it would seem that the material from central Washington might merit recognition as a northern race of the San Gabriel Mountains form. Yet in spite of these disparities, I consider it best at present to regard the specimens from both localities as strictly conspecific; additional material, particularly of the male sex, from each area as well as the intervening region is necessary before this racial problem can be settled satisfactorily.

Distribution.—The present species is an aestival form with apparently a rather wide range. Although known at present from only two widely separated localities: the southern slopes of the San Gabriel Range of southern California and the Walla Walla Plateau of central Washington, further intensive collecting will probably reveal its presence in at least some of the intervening areas—the Mohave Desert, the western portion of the Nevada Basin, and the central Oregon and southwestern Idaho sections of the Columbian plateaux.

Belomicrus minidoka[61] new species (Pl. I, fig. 16; pl. II, fig. 45.)

The almost wholly black habitus and the shape of the squamae cause *minidoka* to superficially resemble the following southern Californian form *timberlakei* with which it agrees in the relative length of the postocellar line and the scape but from which it is distinguished by the more subtile puncturation, the longer interantennal distance, the narrower front and the differently formed medial clypeal lobe.

Type.—♂; Hagerman, Gooding County, Idaho. June 16, 1930. (On *S*[*alsola*] *pestifer*[62] [Russian Thistle].) [United States National Museum.]

Male. 2.5 mm. long. Black; the following stramineous: mandibles except for rufous apices, scape, pronotum dorsally, the tubercles, squamae largely, fore femora apically and beneath, all tibiae on extensor surface, fore tarsi entirely, and middle and hind metatarsi. The following fulvous: pedicel and flagellum beneath, apical margin of clypeal lobe, and flexor surface of all tibiae. Flagellum above and distal four segments of middle and hind tarsi, brunneous. Tegulae and axillary sclerites clear fulvous hyaline. Squamae with outer margins, and apical half of mucro, pellucid-hyaline. Wings clear hyaline, iridescent; stigma and veins brunneous.

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[61] After an Indian place name in southern Idaho.

[62] i.e. *Salsola Kali* var. *tenuifolia.*

Head subopaque, subquadrate, slightly broader than long in anterior aspect; clypeus save for bevel and disc and front with the exception of medially below clothed with dense appressed silvery pile; vertex with inconspicuous short suberect puberulent pubescence; temples with fine appressed silvery pubescence. Front entirely covered with fine rather close puncturation which is more or less obscured by the pile; width at distal end of scapes six-tenths the length of the eye; flat medially, laterally along inner orbits with a broad shallow impression on each side, medially above with an indistinct impressed line from anterior ocellus; inner orbits distinctly divergent above. Vertex with puncturation similar to but not as close as front; with a small abrupt fulgid tubercle behind each eye; ocelli moderate, situated in a curved line, postocellar distance a little more than three times the length of the ocellocular line, from outer hind margins of posterior ocelli a weakly impressed groove runs obliquely forward to dorsal margin of each eye. Temples normal, moderate, together with posttemporal region with fine separated acupuncturation; temporal carinae absent. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus twice as far from each other as from the nearest eye margin; scape straight, subcylindrical to obterete, two-fifths the vertical length of eye; pedicel subcylindrical, subequal in length to first flagellar article; flagellum finely puberulent, all but first and last segments broader than long and none rounded out beneath, ultimate article simple, terete, subequal in length to preceding two segments combined. Clypeus transverse, subfusiform, length medially one-fourth that of eye; flat laterally to moderately tumid discally; produced medially into a short broad subtruncate median lobe, the apical width of which is twice the medial length of clypeus, the apical margin with a narrow transverse linear glabrous nitidous bevel which is margined above, the distolateral angles of lobe acute. Mandibles falcate, the lower margin simple, entire, arcuate.

Thorax subfulgid; clothed with a silvery pubescence which is short, sparse and suberect dorsally, except for a noticeable appressed fascia along posterior margin of mesonotum, and appressed and noticeable on mesopleura and venter. Pronotum narrow, transverse, finely punctate, dorsal surface distinctly notched medially and with anterior margin and humeral angles rounded and declivous. Mesonotum with fine separated punctures between which are suggestions of microscopic acupunctures and occasionally irregular lineations, anterior fourth with an indistinct double longitudinal line medially, discally somewhat depressed; suture between mesonotum simple, strongly impressed; scutellum subsemicircular, with puncturation similar to mesonotum but very obscurely substriate between punctures, gently tumid, not carinate medially, laterally with narrow laminate margins; postscutellum flat, transversely subrectangular, one-third the length of scutellum, finely and closely punctate, posterior margin straight to very faintly arcuate. Squamae flat, sparsely pubescent, lateral in position, semicircular to sublunate, inner margins almost straight and subparallel, apices bluntly rounded. Mucro straight, narrow, linear, apex subtruncate, canaliculate above, two-thirds the length of the scutellum. Mesopleura rather finely closely punctate; rounded anteriorly, no epicnemium; episternal suture distinct, strongly impressed above, hypersternauli obsolescent, mesopleural pit weak, scarcely apparent; epipleura simple, the division between them and mesopleura rather deep, broad, and cavernous. Metapleura glabrous, subfulgid, with weak horizontal striae. Propodeum subopaque, glabrous, basic sculpture microscopically subfavose; dorsal face with outer half of lateral areas flatly and rather abruptly depressed and traversed by fine subparallel somewhat oblique carinulae; posterior face with traces of subparallel horizontal rugulae, the discal areole elongate, narrowly cuneate, strongly demarcated, subnitidous within; lateral carinae well developed for entire length, sublaminate above; lateral faces fulgid anteriorly to opaque posteriorly.

Fore coxae obliquely sulcate; fore tarsi without a pecten. Middle and hind tibiae very weakly spined on extensor surface. Hind femora scarcely bowed, almost straight, the genicular area with a weak keel dorsally and simple, with no traces of fornication distally.

Abdomen subopaque; rather strongly constricted between the segments. Tergites clothed with a fine puberulent pile which is silvery, most noticeable and forms pubescent fasciae along apical margin of each segment; rather closely acupunctate; ultimate tergite with a subquadrate pygidial area which is sparsely but rather coarsely punctate discally, the apical margin truncate. Sternites perfulgid, very sparsely and finely acupunctate and relatively glabrous; hypopygium impunctate with the apex subemarginate medially.

Female. Unknown.

This little early aestival form is known only from the unique male described above from the Snake River Plains of southern Idaho.

Belomicrus istam[63] new species (Pl. I, fig. 15; pl. II, figs. 38, 39.)

From the preceding species of the Cladothricis Group, *istam* is distinguished by having the antennocular distance subequal in length to the interantennal line, agreeing in this respect with the following three forms: *tuktum, timberlakei,* and *mescalero.* It differs markedly from those species, however, in the shape of the squamae, the conformation of the clypeus, the fine subtile puncturation, and the relatively shorter antennal scape. Like *tuktum,* the present species is in all likelihood a derivative of the ancestral protocladothricoid stock.

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[63] After the Istam or Coyote moiety of the Cahuilla Indians of southern California.

Type.—♂; Colorado Desert, four and one-half miles northwest of Edom, Riverside County, California. April 10, 1937. (P. H. Timberlake; flying over sand.) [Academy of Natural Sciences of Philadelphia, Type no. 10565.]

Male. 3 mm. long. Black; the following stramineous: mandibles except for rufous apices, scape anteriorly, pedicel beneath, pronotal tubercles, axillary sclerites, inner margins of squamae, mucro with a median longitudinal line, fore femora apically and beneath on posterior surface, middle and hind femora at knees, fore, middle and hind tibiae on outer face, tarsi basally, and first abdominal tergite with a faint indication of a transverse band apically. The following castaneous: clypeal bevel, scapes posteriorly, fore trochanters, fore femora and tibiae beneath, middle femora above, middle and hind tibiae beneath, and tarsi apically. Antennal flagellum and pedicel brunneous above. Tegulae almost clear hyaline; outer margins of squamae and mucro pellucid-hyaline. Abdomen with first two tergites sordid ferruginous, the third brunneous, remainder black. Wings clear hyaline, iridescent; stigma and veins brunneous.

Head subquadrate in anterior aspect; front and clypeus, except for the glabrous bevel, heavily clothed with appressed bright silvery pubescence, vertex with short suberect inconspicuous pubescence, temples with short appressed silvery pubescence. Front flat, with fine rather close punctures obscured by the heavy pile, inner orbits subparallel to slightly divergent above and below, the front with a wide inconspicuous shallow trough paralleling their upper margins; width at distal end of scapes six-tenths the vertical length of eye; medially above with a faint impressed longitudinal line from anterior ocellus. Vertex fulgid, with fine moderately close puncturation; behind each compound eye with a small sharp compressed tubercle; ocelli large, situated in a curved line, the postocellar distance three times the ocellocular line, the hind ocelli with a straight impressed furrow running obliquely forward from their posterior lateral margins almost to dorsal margins of compound eyes. Temples normal, moderate, with fine well separated acupuncturation; temporal carinae wanting; post-temporal region more or less fulgid and with fine acupuncturation. Antennae short, reaching about to hind ocelli, situated low on face on dorsal margin of clypeus as far from each other as from the nearest eye margin; scape straight, subcylindrical, one-third the length of eye; pedicel subobterete, subequal in length to first flagellar segment; flagellum finely puberulent, all but last segment as broad as or broader than long and all simple, not rounded out beneath, ultimate article simple, terete, subequal in length to the two preceding segments combined. Clypeus narrow, transverse, subfusiform, median length about one-fifth (.22) the vertical length of eye, flat laterally to distinctly tumid discally; produced medio-apically into a short broad subtruncate lobe whose apical width is one and one-third the median clypeal length, apical margin of lobe inconspicuously repand distally and subapically provided with a gently deflexed, glabrous, nitidous, sublinear bevel, the dorsal edge of which it is submarginate and weakly repand. Mandibles subfalcate, apex acute, inner margin with a dentiform angle medially; lower margin entire, arcuate, and provided with long ammochaetae.

Thorax subfulgid; thinly clothed with silvery pubescence which is thicker, appressed and more noticeable on dorsum of pronotum, posterior margin of mesonotum, inner margins of squamae, and mesopleura. Pronotum narrow, transverse, with fine moderately close puncturation throughout, anterior dorsal margin and lateral angles rounded and vertically declivous. Mesonotum fulgid, with well separated and rather scattered fine punctures, anterior fourth with an inconspicuous fine double longitudinal line medially, slightly flattened discally; suture between mesonotum and scutellum deeply impressed, simple; scutellum subsemicircular, flatly tumid, punctured like mesonotum, ecarinate medially, laterally with narrow laminate margins; postscutellum flat, finely punctate, narrow and transversely subrectangular, one-fourth the length of scutellum, posterior margin straight. Squamae large, flat, subreniform, situated laterally, rather strongly incurved behind, the apices bluntly truncate. Mucro straight, acuminate, the apex narrowly truncate, finely canaliculate above, one-half the length of scutellum. Mesopleura subfulgid, punctured like pronotum, rounded anteriorly and with a bare trace of an epicnemium above, episternal suture distinct, hypersternauli obsolescent, mesopleural pit distinct. Metapleura glabrous, perfulgid, with fine horizontal striae. Propodeum glabrous; dorsal and posterior faces subopaque and basically with a fine favose sculpture throughout; dorsal surface with the outer half of each lateral area concave and traversed by fine subparallel oblique rugulae; posterior face traversed by fine subparallel horizontal rugulae laterally, discally with a lenticular areole which is subfavose within; lateral carinae well developed for their entire length, sublamellate medially; lateral faces perfulgid, subnitidous anteriorly to subfavose with a few horizontal striae posteriorly.

Fore legs with the coxae with a strong longitudinal sulcus anteriorly; femora with vestiges of ammochaetae; tarsi without trace of a pecten. Middle tibiae moderately, the hind tibiae strongly spinose on outer posterior face; calcaral furrow of middle tibiae very strong. Hind femora moderately bowed, the genicular carina extending along distal half of dorsal surface and weakly fornicate apically.

Abdomen subopaque; moderately constricted between the first and second and second and third segments. Tergites with a fine rather close acupuncturation throughout and clothed with a fine, short, rather inconspicuous silvery pubescence. Sternites flat, subfulgid, with a scattered series of fine setigerous acupunctures. Pygidium subquadrately trapeziform, the apex very gently and convexly arcuate; the disc fulgid, with scattered coarse setigerous punctures. Hypopygium flat, the apex broadly and inconspicuously retuse.

Allotype.— ♀ ; Topotypical; same data as type. [Timberlake.]

Female. 3.25 mm. long. The following features are solely those noteworthy of difference from the ones given in the foregoing description of the male (type).

Pronotum medially, the postscutellum, and first two abdominal tergites with broad transverse subrectangular maculations apically, stramineous. Clypeal platform fulvous. Abdomen sordid ferruginous throughout.

Head with clypeal lobe medio-apically with a gently declivent, glabrous, nitidous, subcampanulate platform, bevel indistinct, apical margin of lobe gently convexly arcuate. Temporal ammochaetae present; post-temporal region glabrous, nitidous.

Thorax in general same as male, but mesonotum more sparsely and distinctly punctate. Propodeum with discal areole of posterior face obpyriform.

Fore legs with the humeral and femoral ammochaetae present; coxae simple, not sulcate; tarsi with a distinct pecten.

Abdomen subfulgid; more heavily clothed with appressed silvery pubescence than male. Pygidium trigonal, the disc with a few scattered, very coarse and rather large punctures.

Paratype.—1 male, as follows:

CALIFORNIA: Morongo, Riverside County; April 19, 1937; (P. H. Timberlake; at flowers of *Eriogonum*); 1 ♂ ; [Timberlake].

The paratypic specimen agrees with the type in all essential details of livery and structure.

Distribution.—Known at present only from the Conchilla district of the Colorado Desert and the San Gorgonio Pass area of southern California, further collecting throughout this region will doubtless materially increase the range of the present xerothermal vernal species.

Belomicrus tuktum [64] new species (Pl. I, fig. 9; pl. II, fig. 43.)

The distinctively shaped squamae and the long postocellar line separate *tuktum* from all the other members of the Cladothricis Group. The black, rather coarsely punctate habitus and the subequal interantennal-antennocular ratio cause the present species to superficially resemble *timberlakei,* but in addition to the strongly incurved spatuloid squamae and the much longer postocellar distance, *tuktum* differs from that species in the appreciably narrower front, the nitidous post-temporal region, the differently shaped clypeal bevel, and the relatively heavy clothing of silvery vestiture.

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[64] After the Tuktum or Wild Cat moiety of the Cahuilla Indians of southern California.

The present species is apparently an outgrowth of the typical *cladothricis* stock, evolving along lines somewhat similar to, but quite distinct from *timberlakei.*

Type.— ♂ ; Colorado Desert, five miles east of Edom, Riverside County, California. April 10, 1937. (P. H. Timberlake; on *Eriogonum Thomasii.*) [Academy of Natural Sciences of Philadelphia, Type no. 10566.]

Male. 3.5 mm. long. Black; the following stramineous: mandibles except for the rufous apices, scapes anteriorly, pronotal tubercles, inner margins of squamae, and middle and hind tibiae externally at base. Clypeal bevel, fore femora distally and beneath, and all tibiae and tarsi, fulvous. Scapes posteriorly, and axillary sclerites, brunneous. Tegulae translucent dilute badeous. Mucro and outer margins of squamae, pellucid hyaline. Wings clear hyaline, iridescent; veins light brunneous.

Head subquadrate in anterior aspect; front, except for the glabrous antennal scrobes, and clypeus, save for the bevel, heavily clothed with appressed bright silvery pubescence; vertex with the pubescence short, suberect and inconspicuous; temples with appressed conspicuous silvery pubescence. Front flat with rather fine close puncturation obscured by the heavy pubescence and laterally on each side with a wide inconspicuous shallow trough paralleling the subparallel inner orbits which are slightly divergent above and below; width at distal end of scapes slightly more than one-half (.54) the vertical length of the eyes; medially above without an impressed line or furrow from anterior ocellus. Vertex fulgid, with larger, coarser and sparser puncturation than front; behind each compound eye with a small compressed tubercle; ocelli large, situated in a curved line, the postocellar line almost five times the length of the ocellocular distance, the hind ocelli with a straight impressed furrow running obliquely forward from the posterior lateral margins to the dorsal margins of the inner orbits. Temples normal, moderate, with puncturation somewhat finer than vertex; temporal carinae wanting; post-temporal region perfulgid and more or less nitidous. Antennae short, reaching about to hind ocelli, situated low on face on dorsal margin of clypeus, the interantennal distance slightly longer than the antennocular line (1: .8-.9); scape straight, obterete, two-fifths the length of the eye; scape subcylindric, subequal in length to the first flagellar article; flagellum finely puberulent, filiform, at most but twice as long as the scape, all but last segment as broad as or broader than long and simple, not rounded out beneath, the ultimate article simple, terete, three-fourths as long as the two preceding segments combined. Clypeus transverse, subfusiform, median length about one-fourth (.246) the vertical length of eye; produced medio-apically into a short broad lobe, the apical width of which is about twice the median clypeal length, apical margin of lobe gently convexly arcuate distad and provided with a gently deflexed, glabrous, nitidous, narrow transverse elliptical bevel the dorsal edge of which is submarginate; clypeal disc punctate and tumid. Mandibles subfalcate, apex acute, lower margin arcuate, entire, provided with a few long ammochaetae.

Thorax especially the pronotum dorsally, the mesonotum posteriorly, the inner margins of the squamae, and the mesopleura rather heavily clothed with appressed bright silvery pubescence. Pronotum narrow, transverse, subopaque, with moderate and fine puncturation throughout, dorsal surface quite inconspicuously notched medially, anterior dorsal margin and lateral angles rounded and vertically declivous. Mesonotum fulgid, with large, somewhat coarse and separated punctures like those of vertex, anterior fourth with an inconspicuous fine double longitudinal line medially, slightly depressed discally; suture between mesonotum and scutellum deeply impressed, simple; scutellum gently tumid, punctured like mesonotum, ecarinate medially, laterally with narrow laminate margins; postscutellum flat, narrow, transverse, subrectangular, about one-fourth the length of the scutellum, posterior margin gently convex. Squamae large, subreniform, situated laterally, very strongly incurved and almost meeting behind, ampliate distad, the apices more or less spatulate, flat basally to slightly subinvolute apically. Mucro straight, acuminate, the apex very narrowly truncate, finely canaliculate above, one-half the length of the scutellum. Mesopleura subopaque, punctured like pronotum, prepectus rounded anteriorly and without trace of an epicnemium, episternal suture distinct, hypersternauli and mesopleural pit faint. Metapleura glabrous, fulgid, with fine horizontal striae. Propodeum glabrous, subopaque, basic sculpture finely favose throughout; dorsal surface with fine transverse oblique parallel rugulae laterally on outer half; posterior face with lateral areas traversed by a few fine subparallel horizontal rugulae, the discal areole elongate-cuneate and subopaque and finely favose within; lateral carinae well developed, laminate and recurved to subfornicate mesad along lateral margins of posterior face; lateral surfaces favose and subopaque throughout.

Fore coxae strongly and obliquely sulcate anteriorly; fore tarsi without trace of a pecten. Middle and hind tibiae moderate spinose on outer posterior faces; middle tibiae with calcaral furrow very strong. Hind femora moderately bowed and shallowly sulcate medially above just before the genicular carina which extends for half the length of femora and is moderately fornicate apically.

Abdomen subfulgid; strongly constricted between the segments, particularly between the first and second, and the second and third. Tergites with a moderately fine and rather close but distinct puncturation and clothed with a rather conspicuous fine appressed silvery pubescence arranged in a tesselate fashion; sternites relatively glabrous and with a fine microscopic transverse aciculation; pygidium subquadrately trapeziform, the apical margin gently convexly arcuate; hypopygium flat, the apex broadly and roundly emarginate for almost its entire width.

Female. Unknown.

This vernal eremian form is known only from the unique male described above from the Conchilla district of southern California's Colorado Desert.

Belomicrus mescalero[65] new species (Pl. I, fig. 1; pl. II, fig. 48.)

From the preceding species of the Cladothricis Group, *mescalero* and *timberlakei* are distinguished by a combination of features. In both *timberlakei* and *mescalero,* the squamae are semicircular in shape, the interantennal and antennocular distances are subequal in length, and the integument is rather coarsely punctate throughout. To a certain extent, these two latter details are likewise characteristic of the preceding species *tuktum,* but in that form the squamae are very strongly incurved, somewhat distorted and spatuloid apically, while the postocellar line is much longer and the front appreciably narrower than in either *mescalero* or *timberlakei.* Both of these latter species probably evolved from the ancestral stock which gave rise to *cladothricis* and its immediate relatives.

The relatively longer antennal scape and postocellar line, the narrower front, and the distinctly bevelate median lobe of the clypeus differentiate *mescalero* from the following form, *timberlakei.* Furthermore, the abdomen of *mescalero* is usually bright ferruginous, while the head, thorax, abdominal tergites, and the legs and antennae are marked with distinct and characteristic yellow maculations, whereas *timberlakei* is an almost wholly somber funereal black form.

Type.— ♀ ; Alamogordo,[66] Otero County, New Mexico. Elevation, 4320-4600 feet. May 3, 1902. (Henry L. Viereck.) [Academy of Natural Sciences of Philadelphia, Type no. 10567.]

Female. 4 mm. long. Black; the following deep stramineous: mandibles except apices which are rufous, scapes anteriorly, pronotum dorsomedially, prothoracic tubercles, postscutellum, squamae on inner margins, first abdominal tergite with a transverse elongate stripe discoposteriorly, fore femora apically beneath, and all tibiae with a stripe on outer surface. The following fulvous: scapes posteriorly, pedicel, flagellum above (luteous beneath) becoming brunnescent apically, tegulae, axillary sclerites, all tibiae except for stramineous maculations, and all tarsi. Coxae, trochanters and femora brunneous, the femora fulvescent apically. Clypeus with median lobe castaneous. Abdomen bright ferruginous above, pygidium and venter brunnescent. Wings clear hyaline, irridescent; stigma and veins brunneous.

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[65] After the Mescalero, a group of the Apache Indians of south-central New Mexico.

[66] *Cf.* Proc. Acad. Nat. Sci. Phila., LV, p. 17, (1903); *v. et.*: *Idem,* LXI, p. 112, (1909).

Head subquadrate, slightly longer than broad in anterior aspect, subopaque; clypeus save for glabrous disc and lower two-thirds of inner orbits broadly, heavily clothed with appressed flattened silvery pile; vertex with inconspicuous suberect short pubescence; temples moderately clothed with short appressed silvery pubescence. Front with fine moderately close puncturation; width at distal end of scapes not quite one-half (.47) the length of eye; inner orbits gradually divergent above and mesad of each with a broad shallow arcuate pubescent sulcus paralleling the orbits; without a median longitudinal furrow above from anterior ocellus. Vertex subfulgid, with puncturation similar to front but not as close; with a small strongly compressed subtruncate tubercle behind each compound eye; ocelli moderately large, situated in a curved line, the postocellar line four times the length of the ocellocular line, from outer hind margin of posterior ocelli with a fine sulcus running obliquely forward to the dorsal margins of upper inner orbits. Temples normal, moderate, punctured like vertex; temporal carinae wanting; temporal ammochaetae present and well developed; post-temporal region glabrous, nitidous. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus about as far from each other as from the nearest eye margin; scape straight, cylindrical, one-third the length of eye; pedicel cylindrical, subequal in length to the first two flagellar articles combined; flagellum finely puberulent, first two segments subequal in length, last article simple, terete, subequal in length to the two preceding segments combined. Clypeus transverse, sugfusiform, length medially one-fifth that of eye, flat laterally to strongly tumid discally where it is glabrous and nitidous, produced medio-apically into a short broad lobe, the apical width of which is one and one-third times the median longitudinal length of the clypeus, apical margin of lobe gently arcuate and provided with a gently deflexed glabrous nitidous bevel. Mandibles falcate, apices acuminate, inner margins medially with a blunt obtuse tooth; lower margins simple, entire, arcuate, and with the customary ammochaetae.

Thorax subfulgid; mesonotum and scutellum with short inconspicuous suberect light aeneous puberulent pubescence; pronotum and mesopleura more heavily clothed with short appressed puberulent silvery pubescence. Pronotum narrow, transverse, linear, with close fine puncturation; dorsal surface inconspicuously notched medially; anterior dorsal margin and lateral angles rounded; anterior surface declivent and striatopunctate. Mesonotum fulgid, with moderate fine separated and somewhat scattered puncturation, no median longitudinal line anteriorly; suture between mesonotum and scutellum impressed, simple; scutellum subsemicircular to subtrapeziform, gently tumid, punctured like mesonotum, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, transverse, linear-subrectangular, one-fifth the length of the scutellum. Squamae flat, lateral in position and not enclosing the postscutellum, semilunate, not strongly incurved behind, the inner margins gently arcuate, the apices narrow and acutely rounded. Mucro straight, about one-half the length of the scutellum, the lateral margins subparallel to inconspicuously subspatulate apicad, the apex truncate, the dorsal surface canaliculate. Mesopleura with moderate separated punctuation, rounded anteriorly, the prepectus with faint traces of an epicnemium above, episternal suture and mesopleural pit distinctly impressed, the hypersternaulus faint, obsolescent. Propodeum glabrous, subopaque, surface sculpture finely favose basically; inner lateral half of surface of dorsal and posterior faces abruptly elevated above the outer lateral depressed half which on dorsal face is obliquely lineate and on posterior face transverselv lineate, discal areole of posterior face elongate cuneate, acuminate at both dorsal and ventral angles and fulgid and transversely sublineate within; lateral carinae well developed, sublaminate above, inconspicuously bifid ventrally in valvular region; lateral faces miscroscopically favose and inconspicuously horizontally striate.

Fore legs with the humeral, trochanteral and femoral ammochaetae well developed; fore coxae simple, not sulcate anteriorly; fore tarsi with a strong pecten. Middle and hind tibiae furnished with a series of long strong spines on outer posterior margins. Hind femora moderately bowed, the genicular area moderately carinate above but not fornicate apically.

Abdomen subfulgid, not appreciably constricted between the segments; clothed with an inconspicuous sparse decumbent silvery puberulent pile which is heavier and more noticeable along apical margins of tergites. Tergites with a rather close fine puncturation; ultimate tergite with a trigonal pygidium which is two-thirds as long as wide at base and furnished with large coarse separated setigerous punctures, the lateral margins straight to inconspicuously concave, the apex narrowly rounded. Sternites fulgid; with a basic microscopic clathrate aciculation or lineation upon which is superposed a series of well separated more or less scattered coarse punctures, the hypopygium impunctate on basal half.

Male. Unknown.

Paratypes.—2 females, as follows:

New Mexico: Alamogordo, Otero County; elevation, 4320-4600 feet; May 3, 1902; (Henry L. Viereck); 1 ♀; [A.N.S.P.].

California: Needles, San Bernardino County; April 1-6, 1918; (J. C. Bradley); 1 ♀; [Cornell].

Variation.—The topotypic paratype from New Mexico agrees with the type in all essential particulars, except that the postscutellum is black rather than yellow.

The paratype from Needles, California, however, while presenting the same diagnostic facies as the Alamogordo specimens, nevertheless differs from them in being generally devoid of yellow maculations save on the legs, while the abdomen is fuscous rather than bright ferruginous, although the first tergite is largely, and the second is laterally, reddish. Moreover, in the Needles specimen, the postocular tubercles are smaller and not as pronounced as in the topotypical material, while the sculpture of the propodeum is more subtile and the mucro is subacuminate rather than subspatulate apically. But this latter condition may not be a very significant detail inasmuch as the mucro gives evidence of having been somewhat damaged or slightly malformed. Consequently, despite these differences, I regard the Needles specimen at present as merely a melanic form conspecific with the material from Alamogordo, New Mexico, although with the accession of further material, particularly of the males, from each area as well as the intervening region, it may eventually prove worthy of recognition as a distinct subspecies.

Remarks.—Although *mescalero* is known at present only from the female sex, its diagnostic features indicate it is indubitably a member of the Cladothricis Group. Indeed, the interantennal-antennocular ratio, the coarse puncturation and the shape of the squamae of *mescalero* are either identical or very similar to that of *timberlakei*, of which the present form may eventually prove to be merely the female sex. However, in view of the disparities in the length of the antennal scape and the postocellar line, the width of the front, the livery and general colouration, and particularly in the present known ranges of the two species, I do not consider this thesis a likely one. Certainly, much more conclusive evidence than is now at hand must be forthcoming before these two forms may be united.

Distribution.—The present known range of *mescalero* extends from the western foothills of the Sacramento Range and the upper Rio Grande valley of south-central New Mexico to the eastern margin of California's Mohave Desert. The absence of any records in the intervening southern Arizona highlands[67] is undoubtedly due to insufficient collecting of these small late vernal to early aestival forms in that area. Inasmuch as *mescalero* is present at Needles in the eastern margin of the Mohave Desert, it may eventually be found throughout that area as well as in the southern Nevada basin to the north.

Belomicrus timberlakei[68] new species (Pl. I, fig. 13; pl. II, fig. 32.)

The chief differential features which separate the present form from practically all the other members of the Cladothricis Group have been given in the introductory discussion of the preceding species, *mescalero*. From that form, *timberlakei* may be distinguished by the relatively shorter antennal scape and postocellar line, the broader front, the wholly black habitus, and the differently formed clypeal lobe, all of which are described below.

Type.— ♂ ; Riverside, Riverside County, California. May 14, 1925. (P. H. Timberlake; on *Eriogonum fasciculatum* [California Buckwheat].) [Academy of Natural Sciences of Philadelphia, Type no. 10568.]

Male. 3 mm. long. Black; mandibles orchraceous, their apices rufous. Squamae with inner margins stramineous, their outer margins and mucro pellucid. Clypeus medio-apically castaneous; tegulae and axillary sclerites translucent castaneous. Scapes, pedicel, and legs fuliginous; the femora narrowly at apex testaceous. Wings clear hyaline, iridescent; veins fuscious.

Head subfulgid, suborbicular, slightly longer than wide in anterior aspect; clypeus and front laterally clothed with appressed silvery pubescence, the latter with the lower half glabrous medially, the upper half and vertex with sparser suberect puberulent silvery pubescence; temples with short appressed silvery pubescence. Front flat; inconspicuously concave medially below; with moderate close puncturation; width at distal ends of scapes three-fifths the length of the eyes; with a faint trace of an impressed median longitudinal line from the anterior ocellus. Vertex with puncturation similar to that of front, with an acute compressed tubercle behind each compound eye; ocelli large, situated in a curved line, postocellar line two and three-quarters to three times the length of the ocellocular line; laterad of the posterior ocelli is a small fossa and from the outer posterior lateral margin of the hind ocelli an impressed line runs obliquely forward to the

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[67] *Cf.* footnote 53 under the remarks on the distribution of *cladothricis cladothricis* on a preceding page.

[68] Dedicated to Philip Hunter Timberlake of Riverside, whose careful collecting throughout southern California and adjacent areas has done much toward increasing our knowledge of the insect fauna of that region.

dorsal margins of the compound eyes. Temples normal, moderate, with puncturation similar to vertex but also inconspicuously striatopunctate; post-temporal region subopaque, punctate; temporal carinae wanting. Antennae short, reaching about to occiput, situated low on face on dorsal margin of clypeus as far from each other as from the nearest eye margin; scape straight, obterete, two-fifths the length of the eye; pedicel subcylindrical, subequal in length to the first two flagellar articles combined; flagellum finely puberulent, about twice as long as the scape, filiform to inconspicuously incrassate medially to apex, ultimate article simple, terete, subequal in length to the two preceding segments combined. Clypeus transverse, subfusiform, length medially one-fifth that of eye, flat and pubescent laterally to glabrous, punctate and subtrigonally tumid discally, produced medio-apically into a short broad subtruncate lobe, the apical margin of which is inconspicuously convexly arcuate and subapically with a narrow, transverse, linear, nitidous, glabrous subbevelate area which is not distinctly margined above. Mandibles stumpy, falcate, apex acute, inner margins with a low blunt tooth, lower margins simple, entire, arcuate.

Thorax fulgid; clothed with decumbent puberulent pubescence, which is silvery on pronotum, the tubercles and mesopleura and subaeneous on the mesonotum, scutellum and postscutellum. Pronotum narrow, transversely linear, with fine close acupuncturation; dorsal surface inconspicuously notched medially; anterior margin and lateral angles rounded and vertically declivous; anterior surface finely acupunctate to subfavose. Mesonotum with close moderate setigerous puncturation; anterior fourth with an inconspicuous median longitudinal line; slightly depressed discally; suture between mesonotum and scutellum deeply impressed and subconsute; scutellum gently tumid, punctured like mesonotum, not carinate medially, laterally with narrow laminate translucent margins; postscutellum flat, transverse, subrectangular, one-third the length of the scutellum, the posterior margin convexly arcuate. Squamae flat, lateral in position, subsemilunate, the inner margins almost straight, subparallel. Mucro straight, acuminate, apex obtuse, weakly canaliculate above, two-thirds the length of the scutellum. Mesopleura punctured like mesonotum; prepectus tumid, rounded anteriorly with a trace of an epicnemium above; episternal suture strongly impressed and consute; hypersternaulus and mesopleural pit weak; epipleura simple. Metapleura glabrous, fulgid, with fine horizontal striae. Propodeum glabrous, subfulgid, basically finely favose; dorsal face with a few transverse oblique rugulae laterally and medio-laterally on each side with a shallow inconspicuous oblique sulcus passing down upon posterior face toward the discal areole; posterior face traversed laterally by a few inconspicuous horizontal rugulae, discal areole obcuneate, acuminate ventrally, obtusely acute dorsally, the median carina running to base of mucro; lateral carinae laminate, well developed for their entire length; lateral faces finely striatofavose anteriorly.

Fore coxae with a broad oblique sulcus on anterior surface; fore tarsi without a pecten. Middle and hind tibiae weakly spined on outer posterior margin. Hind femora almost straight, the genicular area inconspicuously carinate apically above but not fornicate.

Abdomen subfulgid; strongly constricted between the segments. Tergites clothed with moderate appressed silvery pubescence and with fine moderately close puncturation. Sternites relatively glabrous and sparsely acupunctate. Last tergite with a distinct pygidial area which is transversely trapeziform, broader than long, the lateral margins converging distad, the apex gently convexly arcuate, the disc relatively coarsely punctate.

Female. Unknown.

Paratype.—1 male, as follows:

CALIFORNIA: Riverside, Riverside County; May 7, 1925; (P. H. Timberlake; on *Euphorbia albomarginata* [Rattlesnake weed]); 1 ♂ ; [Timberlake].

Distribution.—Known at present only from the two specimens recorded above from Riverside, *timberlakei* will in all probability eventually be found rather widespread throughout the southern piedmont of the Transverse Ranges district[69] of southern California.

Belomicrus bridwelli[70] new species (Pl. I, fig. 6; pl. II, figs. 40, 41.)

Like *viereckí*, the present species has the squamae falciform, but this cannot be interpreted as evidence of its affinity to that species for *bridwelli* lacks the temporal carinae which are so characteristic of that form, and moreover, is furnished with distinct postocular tubercles rather than the nitidous callosities displayed by *viereckí*. Furthermore, the males of *bridwelli* have the fore coxae obliquely sulcate, as do the members of the preceding Cladothricis Group to which it is most closely allied, but from which, in addition to the shape of the squamae, *bridwelli* may be distinguished by the structure of the postscutellum and propodeum, the coarser puncturation, and the convex venter. The nearest relative of the present species is probably the southwestern form *timberlakei* but it has evidently been dissociated from the ancestral stock of that species for a considerable length of time.

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[69] The term "Transverse Ranges" is used here in the sense of R. D. Reed. [*Cf.* his Geology of California, Amer. Ass. Petr. Geol., 1933.]

[70] Named for Dr. J. C. Bridwell who took the first specimens of this interesting little form

Type.—♂; Clifton, Fairfax County, Virginia. June 30, 1935. (K. V. Krombein.) [Academy of Natural Sciences of Philadelphia, Type no. 10569.]

Male. 2.5 mm. long. Black; mandibles fulvous except for the deep rufous apices. Tibiae apically, tarsi, tegulae and axillary sclerites fuscous. Squamae luteous on apical half. Wings clear hyaline; stigma and veins fuscous.

Head subquadrate in anterior aspect, fulgid; clypeus except discally and lower half of inner orbits broadly clothed with dense appressed silvery pile, remainder of front and vertex with inconspicuous erect short subaeneous pubescence; temples very sparsely clothed with short decumbent light pubescence. Front with close moderately fine puncturation, width at distal end of scapes two-thirds length of eyes; scapal basin flat, above which on upper half the front is tumid. Vertex anteriorly with puncturation similar to front, becoming striatopunctate posteriorly; behind each eye with an acute sharply compressed subtruncate tubercle; ocelli situated in a very low triangle, the postocellar line four times the ocellocular line, with a subnitidous fossa laterad of each posterior ocellus from which a groove runs obliquely forward to the dorsal margin of the inner orbits. Temples finely striatopunctate, temporal carinae wanting; post-temporal region glabrous, finely punctate. Antennae short, reaching about to the occiput, situated low on the face on dorsal margin of the clypeus one and one-third times as far from each other as from the nearest eye margin; scape straight, obterete, four-tenths as long as the eye; pedicel subequal to the first two flagellar articles; flagellum finely puberulent, first two segments subequal in length, broader than longer and not rounded out beneath, remaining segments similar except last article which is simple, terete, and subequal in length to the preceding two segments combined. Clypeus transverse, subfusiform, length medially three-tenths that of eye, finely punctured (except for bevel) like front, flat laterally to gently tumid discally, produced medioapically into a short broad truncate lobe, the apical width of which is four-tenths the length of the eye and which is furnished apically with a broad transverse glabrous sublunate subnitidous subbevelate area. Mandibles subfalcate, apices acute, inner margins with a small inconspicuous obtuse tooth medially; lower margin simple, entire, arcuate.

Thorax subopaque to subfulgid; clothed with inconspicuous short erect to decumbent light pubescence dorsally and on mesopleura and venter. Pronotum narrow, transverse, linear; with very fine close puncturation; dorsal surface perceptibly notched medially; anterior dorsal margin and lateral angles rounded; anterior face declivent and finely longitudinally lineate. Mesonotum with close moderately fine puncturation, without trace of a median longitudinal line anteriorly; sutures between mesonotum and scutellum and scutellum and postscutellum very deeply impressed and inconspicuously subconsute; scutellum punctured like mesonotum, gently tumid, not carinate medially, laterally with narrow laminate margins; postscutellum flat, transverse, linear, length medially one-fourth the length of scutellum, finely closely punctate, posterior margin produced medially into a low broad obtuse subtrigonal projection. Squamae distinctly falciform, flat, lateral in position, their apices acuminate. Mucro acuminate, one-half the length of the scutellum, canaliculate above, apex very narrowly truncate. Mesopleura with moderate close puncturation, rounded anteriorly, no epicnemium present, mesopleural pit and episternal suture distinctly impressed, the latter subconsute and strongly impressed below, hypersternaulus strongly impressed anteriorly like episternal suture but abruptly obsolescent behind; metapleura glabrous, subfulgid, finely horizontally striate. Propodeum glabrous, fulgid, finely favose basically; dorsal face with each side bisected by an oblique carinule emanating from the dorsolateral angles of the discal areole of the posterior face and distolaterad of this oblique carinule with transverse oblique subparalled rugulae; posterior face with the discal areole obcuneate, acuminate ventrally, acute dorsally, enclosed by strong carinulae which pass ventrally to the valvular region and dorsally to the base of the mucro, transversely substriate within; lateral carinae well developed, sublaminate above, bifid ventrally below; lateral faces with inconspicuous oblique lineations.

Fore coxae with a broad oblique sulcus anteriorly; fore tarsi without a pecten. Middle and hind tibiae with a few moderately strong spines on outer posterior face. Hind femora very weakly bowed at most, the genicular area moderately carinate distally above but with no trace of fornication.

Abdomen subfulgid; quite strongly constricted between the segments; sparsely clothed with a short decumbent pubescence which is silvery and most noticeable on apical margins of tergites. Tergites rather weakly inflexed at the sides; with fine close puncturation; the first tergite with a deep median longitudinal sulcus on basal half; ultimate tergite with a trapeziform pygidium which is as long as wide at base, the lateral margins converging gently apicad, the apical margin gently convexly arcuate, the disc fulgid and with scattered coarse setigerous punctures. Sternites moderately convex, with a finer sparser puncturation than the tergites; hypopygium flat, opaque, the apical margin broadly shallowly emarginate.

Allotype.— ♀; Clifton, Fairfax County, Virginia. June, 1933. (J. C. Bridwell.) [United States National Museum.]

Female. 2.5 mm. long. Agrees in all essential respects with the male (type) except in the following features:

Head with front not tumid above; temporal and mandibular ammochaetae present; post-temporal region glabrous, nitidous.

Thorax in general as in male but somewhat more subtilely sculptured.

Fore legs with the trochanteral and femoral ammochaetae present but weak; for coxae simple, not sulcate; fore tarsi with a weak pecten. Middle and hind legs as in male.

Abdomen in general as in male but first abdominal tergite with the median longitudinal sulcus not as pronounced as in male. Ultimate tergite with a trigonal pygidium which is two-thirds as long as wide at base, the lateral margins straight, converging distad, the apex narrowly rounded, the disc furnished with coarse well separated setigerous punctures.

Paratypes.—3 males, as follows:

VIRGINIA: Clifton, Fairfax County; May 6 and June 11, 1933; (J. C. Bridwell); 3 ♂; [U.S.N.M.].

The allotype and paratypic specimens which were originally preserved in liquid, probably alcohol, agree with the type in all essential structural details.

Distribution.—The present species is a late vernal to early aestival form, known as yet only from the type locality in north-central Virginia. From a distributional standpoint, *bridwelli* is remarkable in that it is the only Nearctic species of *Belomicrus* known east of the Great Plains area.

EXPLANATION OF FIGURES

PLATE I

Scutellum, postscutellum, squamae and mucro: (Greatly enlarged; all figures drawn to same scale).

Fig. 1.—*Belomicrus mescalero* new species. Female (*type*). Alamogordo, Otero County, New Mexico.

Fig. 2.—*Belomicrus coloratus* Baker. Female. Adelaide, Minidoka County, Idaho.

Fig. 3.—*Belomicrus cookii* Baker. Male. Claremont, Los Angeles County, California.

Fig. 4.—*Belomicrus forbesii forbesii* (Robertson). Female (*allodigm*). Canyon of the Cache la Poudre, Larimer County, about twenty miles west of Fort Collins, Colorado.

Fig. 5.—*Belomicrus vanyume* new species. Female (*type*). Victorville, Mohave Desert, California.

Fig. 6.—*Belomicrus bridwelli* new species. Male (*type*). Clifton, Fairfax County, Virginia.

Fig. 7.—*Belomicrus vierecki* new species. Male (*type*). Alamogordo, Otero County, New Mexico.

Fig. 8.—*Belomicrus pachappa* new species. Female (*type*). Riverside, California.

Fig. 9.—*Belomicrus tuktum* new species. Male (*type*). Colorado Desert, five miles east of Edom, Riverside County, California.

Fig. 10.—*Belomicrus cladothricis prosopidis* new subspecies. Female (*allotype*). Palm Springs, Riverside County, California.

Fig. 11.—*Belomicrus cladothricis eriogoni* new subspecies. Female (*allotype*). San Lucas, Monterey County, California.

Fig. 12.—*Belomicrus cladothricis cladothricis* (Cockerell). Female. Six miles northeast of Embudo, Rio Arriba County, New Mexico.

Fig. 13.—*Belomicrus timberlakei* new species. Male (*type*). Riverside, California.

Fig. 14.—*Belomicrus sechi* new species. Male (*type*). Colorado Desert, six miles north of Palm Springs, Riverside County, California.

Fig. 15.—*Belomicrus istam* new species. Male (*type*). Colorado Desert, four and one-half miles northwest of Edom, Riverside County, California.

Fig. 16.—*Belomicrus minidoka* new species. Male (*type*). Hagerman, Gooding County, Idaho.

Fig. 17.—*Belomicrus apache* new species. Female (*type*). Las Cruces, Doña Ana County, New Mexico.

Fig. 18.—*Belomicrus cucamonga* new species. Female (*type*). Camp Baldy, San Gabriel Mountains, San Bernardino County, California.

Fig. 19.—*Belomicrus cahuilla* new species. Male (*type*). Andreas Canyon, Palm Springs, Riverside County, California.

Fig. 20.—*Belomicrus franciscus* Pate. Male (*paratype*). Lone Mountain, San Francisco, California.

Fig. 21.—*Belomicrus serrano serrano* new species. Male (*type*). Tujunga Wash, San Gabriel Mountains, Los Angeles County, California.

Fig. 22.—*Belomicrus jurumpa* new species. Male (*type*). Gavilan, Riverside County, California.

Fig. 23.—*Belomicrus quemaya* new species. Male (*type*). Palm Springs, Riverside County, California.

Fig. 24.—Antennal scape of *Belomicrus sechi* new species. Male (*type*). Colorado Desert, six miles north of Palm Springs, Riverside County, California.

PLATE II

Structure of clypeus: (Greatly enlarged; all figures drawn to same scale).

Fig. 25.—*Belomicrus serrano mono* new subspecies. Female (*type*). •Sherwin Hill, five miles north of Round Valley, Owens Valley, Mono County, California.

Fig. 26.—*Belomicrus serrano serrano* new subspecies. Female (*allotype*). Claremont, Los Angeles County, California.

Fig. 27.—*Belomicrus franciscus* Pate. Female (*allotype*). Lone Mountain, San Francisco, California.

Fig. 28.—*Belomicrus cahuilla* new species. Male (*type*). Andreas Canyon, Palm Springs, Riverside County, California.

Fig. 29.—*Belomicrus coloratus* Baker. Female. Adelaide, Minidoka County, Idaho.

Fig. 30.—*Belomicrus cookii* Baker. Male. Claremont, Los Angeles County, California.

Fig. 31.—*Belomicrus cookii* Baker. Female. Claremont, Los Angeles County, California.

Fig. 32.—*Belomicrus timberlakei* new species. Male (*type*). Riverside, California.

Fig. 33.—*Belomicrus cladothricis cladothricis* (Cockerell). Male (*allodigm*). Hodge, Mohave Desert, San Bernardino County, California.

Fig. 34.—*Belomicrus cladothricis prosopidis* new subspecies. Male (*type*). Palm Springs, Riverside County, California.

Fig. 35.—*Belomicrus cladothricis cladothricis* (Cockerell). Female. Six miles northeast of Embudo, Rio Arriba County, New Mexico.

Fig. 36.—*Belomicrus cucamonga* new species. Female (*type*). Camp Baldy. San Gabriel Mountains, San Bernardino County, California.

Fig. 37.—*Belomicrus pachappa* new species. Female (*type*). Riverside, California.

Fig. 38.—*Belomicrus istam* new species. Female (*allotype*). Colorado Desert, four and one-half miles northwest of Edom, Riverside County, California.

Fig. 39.—*Belomicrus istam* new species. Male (*type*). Colorado Desert, four and one-half miles northwest of Edom, Riverside County, California.

Fig. 40.—*Belomicrus bridwelli* new species. Male (*type*). Clifton, Fairfax County, Virginia.

Fig. 41.—*Belomicrus bridwelli* new species. Female (*allotype*). Clifton, Fairfax County, Virginia.

Fig. 42.—*Belomicrus apache* new species. Female (*type*). Las Cruces, Doña Ana County, New Mexico.

Fig. 43.—*Belomicrus tuktum* new species. Male (*type*). Colorado Desert, five miles east of Edom, Riverside County, California.

Fig. 44.—*Belomicrus sechi* new species. Male (*type*). Colorado Desert, six miles north of Palm Springs, Riverside County, California.

Fig. 45.—*Belomicrus minidoka* new species. Male (*type*). Hagerman, Gooding County, Idaho.

Fig. 46.—*Belomicrus vierecki* new species. Female (*allotype*). Alamogordo, Otero County, New Mexico.

Fig. 47.—*Belomicrus vierecki* new species. Male (*type*). Alamogordo, Otero County, New Mexico.

Fig. 48.—*Belomicrus mescalero* new species. Female (*type*). Alamogordo, Otero County, New Mexico.

Fig. 49.—*Belomicrus quemaya* new species. Male (*type*). Palm Springs, Riverside County, California.

Fig. 50.—*Belomicrus jurumpa* new species. Male (*type*). Gavilan, Riverside County, California.

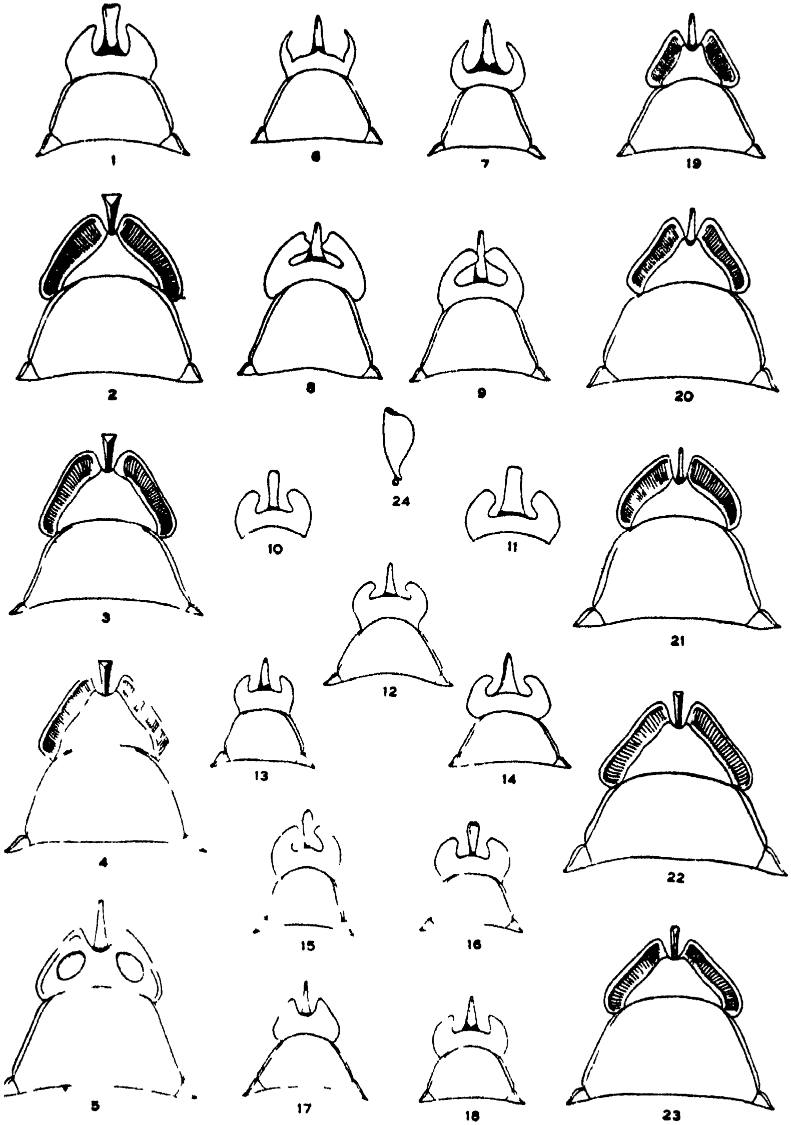
Fig. 51.—*Belomicrus serrano serrano* new subspecies. Male (*type*). Tujunga Wash, San Gabriel Mountains, Los Angeles County, California.

Fig. 52.—*Belomicrus franciscus* Pate. Male (*type*). Lone Mountain, San Francisco, California.

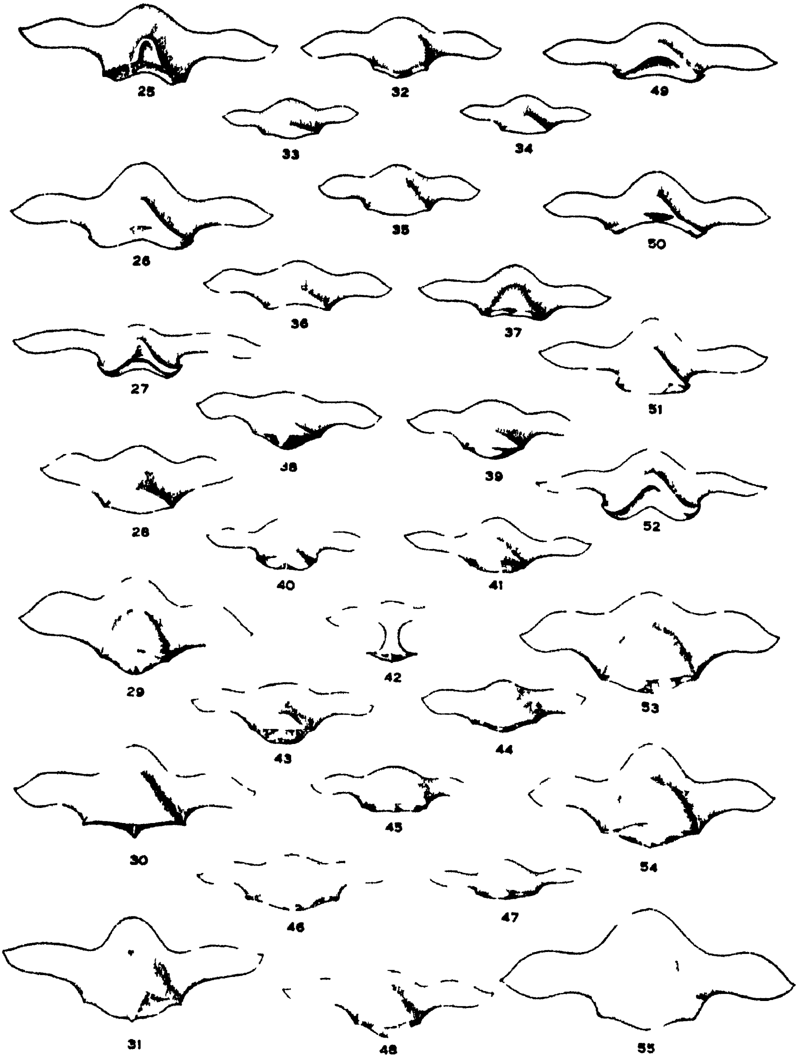
Fig. 53.—*Belomicrus vanyume* new species. Female (*type*). Victorville, Mohave Desert, San Bernardino County, California.

Fig. 54.—*Belomicrus forbesii forbesii* (Robertson). Male. Canyon of the Cache la Poudre, Larimer County, about twenty miles west of Fort Collins, Colorado.

Fig. 55.—*Belomicrus forbesii forbesii* (Robertson). Female (*allodigm*). Canyon of the Cache la Poudre, Larimer County, about twenty miles west of Fort Collins, Colorado.



PATE—OXYBELINE WASPS



PATE—OXYBELINE WASPS

THE APPLICATION, RELATIONSHIP AND SPECIES OF SCYLLINA STÅL, 1861, AND SCYLLINOPS REHN, 1927

(ORTHOPTERA: ACRIDIDAE; ACRIDINAE)

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(Plate III and text-figures)

In his study of the Orthoptera collected on the voyage of the Swedish frigate Eugenie, Stål described[1] an acridid as *Gomphocerus* (*Epacromia*) *peragrans,* from material of both sexes taken on Puna Island in the Gulf of Guayaquil, Ecuador. Some years later he erected the genus *Scyllina,*[2] including in it two species, i. e. his *Gomphocerus peragrans* and Saussure's *Stenobothrus viatorius,* the latter described in 1861[3] from Mexico. Of these the former was subsequently, in 1906, selected as the genotype of *Scyllina* by Rehn,[4] a course followed by Kirby in 1910.[5] Stal's types are in the collections of the Stockholm Museum, and have recently been figured by Sjöstedt,[6] but on a very small scale and without the essentially necessary details which would generically place the species and incidentally the genus. It is quite apparent, however, that the original specific description stresses more the contrasted color pattern seen in the male individual figured, and in consequence I here select that specimen as the single type. The literature of the years since

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[1] Kongl. Svenska Fregatten Eugenies Resa, Zool., I, 5, p. 343, (1861).

[2] Recensio Orthopt., I, pp. 94, 112, (1873).

[3] Revue et Mag. de Zool., 2e ser., XIII, p. 317, (1861).

[4] Proc. Acad. Nat. Sci. Phila., 1906, p. 41, (1906).

[5] Syn. Catal. Orth., III, p. 132, (1910).

[6] Arkiv för Zoologi, 24 A, no. 1, p. 13, pl. 1, figs. 6a (♂) and 6b (♀), (1932).

1861 contains no other information on *peragrans* drawn from type or topotypic material.

For some decades Stål's *peragrans* was permitted to stand as a valid member of the genus for which, by general acceptance, his generic name *Scyllina* was used, an entity clearly containing Saussure's *viatorius,* which had been associated generically with his *peragrans* by Stål. A matter of sixteen years ago, after the study of extensive series of this genus from a large number of localities, my colleague, Mr. Morgan Hebard, concluded[7] that *peragrans* of Stål was based upon the species to which Fabricius, a good part of a century earlier than Stål, had applied the name *Gryllus cyanipes.*[8] While Hebard had at that time no Puna Island material, he did have material of *Scyllina,* as then understood, from Loja, Ecuador, which he subsequently reported as *cyanipes.*[9] In his 1923 discussion the opinion is given that, " Stål's Ecuadorean *peragrans* we believe was described from discolored material which had lost its natural caudal tibial coloration ".

Recently in assembling from a number of series material of certain acridid genera, I encountered a single male specimen taken on Puna Island, Ecuador, and received from Prof. F. Campos, of Guayaquil, Ecuador. I saw at once this was specifically different from anything I had previously examined, although its generic relationship was quite evident after a brief examination. Certain characteristics of the species stirred half forgotten memories, and soon I was comparing it with the original description of Stål's *peragrans,* with which, feature by feature, it completely tallied. As a result not only must Stål's species be reestablished, but the generic name *Scyllina* is now found to be based a distinct generic unit, requiring redefinition in the light of present-day knowledge, related on one hand to *Rhammatocerus* Saussure, as limited on a following page, and on the other to *Scyllinops* Rehn,[10] erected in 1927 upon *Stirapleura bruneri* Rehn, described from Argentina over twenty years earlier.

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[7] Trans. Amer. Entom. Soc., XLIX, p. 211, (1923).

[8] Syst. Entom., p. 292, (1775). [" America ".]

[9] Proc. Acad. Nat. Sci. Phila., LXXVI, p. 174, (1924).

[10] Trans. Amer. Entom. Soc., LIII, p. 228, (1927).

On a subsequent page I have redescribed and am here refiguring Stål's *peragrans* from the Puna Island specimen now available, and have compared Stål's *Scyllina*, as now properly understood, with the generic entity for which that name has been currently used for a number of decades. It has been necessary, however, to determine what generic name should be used for this latter assemblage.

Recently Dr. B. P. Uvarov called my attention to Saussure's use of the name *Rhammatocerus*,[11] which I saw at once was available for *Scyllina* of authors, but not of Stål as restricted by the already selected genotype. This fortunately removed a debatable point as to the date from which the next applicable name would be quoted. Both Fieber [12] and Fischer[13] used the term employed by Saussure, but in its plural and thus unavailable form, i. e. Rhammatoceri, as a group designation, but Saussure applied it in a subgeneric sense, and in its singular form, as a division of the genus *Stenobothrus*. As used by this last mentioned author it comprised two unnamed subdivisions, the first of two previously undescribed species, *mystecus*, from Mexico, and *occidentalis*, from Tennessee, both now referred to the genus *Amblytropidia* Stål 1874, and the second including four similarly new species, i. e. *viatorius*, from Mexico, *gregarius*, from St. Thomas and Haiti (=*cyanipes* Fabricius, see text-fig. 2), *chilensis*, from Chile, and *tepanecus*, from Mexico. As no type has to date been selected for *Rhammatocerus*, of these six included forms I am here selecting *Stenobothrus* (*Rhammatocerus*) *viatorius* Saussure as its genotypic species (see text-fig. 1). With that species *gregarius* is congeneric, *chilensis* probably equals *Scyllina signatipennis* (Blanchard), and *tepanecus* is a member of the genus *Orphulella* Giglio-Tos, 1894.

The next name which was used for the genus to which *Rhammatocerus* Saussure is here limited, is *Pseudostauronotus*, first used by Brunner[14] in a key with a seven-word dichotomous characterization and no indicated included species. It was there contrasted with *Scyllina* Stål, as understood for years subsequently, in the following brief fashion:

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[11] Revue et Mag. de Zool., 2e Ser., XIII, p. 317, (1861).

[12] Grundlage zur Kenntniss der Orthopteren Oberschlesiens, in Kelch, Zu der öffentlichen Prüfung aller Klassen, etc., Ratisbor, p. 4, (1852): Lotus, III, p. 101, (1853).

[13] Orth. Europ., p. 315, (1854).

"6. Frons parum reclinata. Foveolae verticis distinctius delineatae. Habitus Stauronoti. *Pseudostauronotus* gen. nov.

"6'. Frons valde reclinata. Foveolae verticis obtusae. *Scyllina* Stål."

In the opinion of many students generic units proposed without included species are not valid until one or more species have been directly, and by name, referred to them. The author has long shared this belief, and followed it in his work. Under any circumstances in such cases the genotype must be the first species subsequently referred to that genus, or the genotype must be selected from those so placed if more than a single species is mentioned in the first reference of species to the genus.

The first definite reference of a species to the genus *Pseudostauronotus* was by Giglio-Tos, who in 1895 described *Pseudostauronotus brunneri* from Paraguay.[15] In consequence *brunneri* (see text-fig. 3), which is congeneric with *Stenobothrus viatorius* Saussure, is the genotype of *Pseudostauronotus,* regardless of whether the name is dated from Brunner or Giglio-Tos, which latter I feel is the correct course to follow. Scudder has shown,[16] from the evidence of material sent him by Brunner, that at least certain of the forms considered by that author to belong to *Pseudostauronotus* are referable to the very much older *Stirapleura* of the former author. In addition other material now in my hands, clearly referable to *Scyllinops* as here understood, is labelled presumably in Brunner's handwriting as an undescribed species of *Pseudostauronotus.* I discussed rather fully the *Pseudostauronotus* situation a matter of over thirty years ago.[17]

Summarized the synonymy of the two genera is as follows:

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[14] Ann. Mus. Civ. Stor. Nat. Genova, XXXIII, p. 123, (1893).

[15] Zool. Jahrb., Abth. Syst., VIII, p. 808, (1895).

[16] Canad. Entom., XXIX, p. 76, (1897).

[17] Proc. Acad. Nat. Sci. Phila., 1906, pp. 41-42, (1906).

RHAMMATOCERUS Saussure

1861. *Rhammatocerus* Saussure Revue et Mag. de Zool., 2e ser., XIII, p. 317. (Genotype (here selected): *Stenobothrus* (*Rhammatocerus*) *viatorius* Saussure.)

1893. *Pseudostauronotus* Brunner, Mus. Civ. Stor. Nat. Genova, XXXIII, p. 123. (No included species.)

1895. *Pseudostauronotus* Giglio-Tos, Zool. Jahrb., Abth. für Syst., VIII, p. 808. (Genotype (by monotypy): *Pseudostauronotus brunneri* Giglio-Tos.)

1897. *Plectrophorus* McNeill, Proc. Davenport Acad. Nat. Sci., VI, pp. 198, 251. (Not of Ferussac, 1819.) (Included *Stenobothrus viatorius* and *gregarius* Saussure.)

1897. *Plectrotettix* McNeill, Psyche, VIII, p. 71. (To replace *Plectrophorus* McNeill, not of Ferussac.)

SCYLLINA Stål

1873. *Scyllina* Stål, Recensio Orthopt., I, pp. 94, 112. (Genotype (by selection of Rehn, 1906): *Gomphocerus* (*Epacromia*) *peragrans* Stål.)

A comparison of the above mentioned topotypic male of *Scyllina peragrans* (Stål)[18] with a representative male of *Rhammatocerus viatorius* (Saussure)[19] shows the following differential features, which collectively have generic value.

Lateral foveolae of fastigium clearly outlined and moderately to deeply excavate, instead of hardly excavate and poorly defined, as in *R. viatorius*. Pleura weakly, shallowly and incompletely impresso-punctate, instead of deeply, solidly and cribrosely eroso-punctate as in *Rhammatocerus*. Pronotal disk with prozona and metazona nearly or quite equal in length, instead of latter being distinctly longer than former, as in the contrasted genus.[20] Interspace between mesosternal lobes definitely transverse in both sexes, instead of slightly longitudinal as in *Rhammatocerus*.

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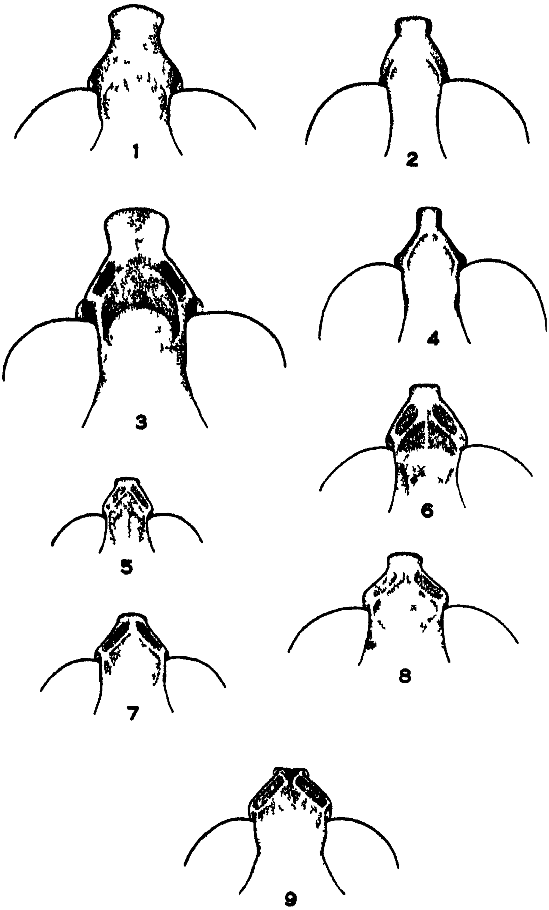
[18] Puerto Grande, Puna Island, Gulf of Guayaquil, Ecuador; (F. Campos); [Hebard Collection].

[19] Guadalajara, Jalisco, Mexico; (Crawford); [A.N.S.P.].

[20] A comprehensive re-examination of all the species which have been assigned to *Rhammatocerus* may show that they are capable of arrangement into several categories on this feature, which in some forms is less markedly diagnostic than in the genotype. This is a matter for future study which cannot be attempted at this time.



Explanation of text-figures. Dorsal views of fastigia All greatly enlarged. 1.—*Rhammatocerus viatorius* (Saussure), ♂, Guadalajara, Jalisco, Mexico. 2.—*Rhammatocerus cyanipes* (Fabricius), ♂, San Juan, Porto Rico. 3.—*Rhammatocerus brunneri* (Giglio-Tos), Chapada, Matto Grosso, Brazil. 4.—*Scyllina peragrans* (Stål), ♂, Puerto Grande, Puna Island, Ecuador. 5.—*Scyllinops bruneri* (Rehn), ♂ (allotype), Carcaraña, Argentina. 6.—*Scyllinops bruneri* (Rehn), ♀ (type), Carcaraña, Argentina. 7.—*Scyllinops liebermanni* new species, ♂ (allotype), Neuquen, Argentina. 8.—*Scyllina liebermanni* new species, ♀ (type), Neuquen, Argentina 9.—*Borellia carinata* Rehn, ♀ (paratype), Chapada, Matto Grasso, Brazil

The broad range of species which had been placed in *Rhammatocerus* (then termed *Scyllina*) was emphasized by me in 1906.[21] Some features which previously had been considered of generic or subgeneric value were then discussed in the light of material representing fourteen of the species now considered valid.

Generic characters.—Alate. Disk of fastigium subtransversely excavate, acute to obtuse-angulate in cephalic outline; lateral foveola of fastigium definite and excavate, rhomboidal to trapeziform in outline;[22] fastigio-facial angle in profile rounded subacute, facial line retreating; frontal costa widening ventrad, surface transversely rounded to shallowly sulcate medio-longitudinally.[23] Antennae simple. Pronotum substrangulate, its disk not greatly surpassing the dorsum of the head in length, prozona and metazona of disk nearly or quite equal in length;[24] caudal margin of pronotal disk obtuse-angulate produced; median carina well marked but delicate; lateral carinae of disk cruciform, usually subobsolete between the first and second transverse sulci;[25] lateral lobes of pronotum deeper than long, subrectangulate, caudal margin straight to subconcave, ventral margin obtuse-angulate. Pleura shallowly, incompletely and weakly impresso-punctate.[26] Tegmina and wings with their apices slightly surpassing the abdominal apex. Interspace between mesosternal lobes transverse.[27] Cephalic femora uninflated in the male sex. Caudal femora with genicular lobes of normal depth; internal pair of caudal tibial spurs very unequal in length, the shorter at most but little more than half the length of the larger one.

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[21] Proc. Acad. Nat. Sci. Phila., 1906, pp. 40-42.

[22] In *S. salina,* while agreeing with the above in the male, they are subovoid in outline in the female sex.

[23] This only in both sexes of *S. obscura* (Bruner).

[24] In *S. signatipennis* alone is there any evident difference in length of the two areas, and there apparent in the female sex alone.

[25] Continuously evident only in *S. humilis* (both sexes).

[26] The presence of pleural punctae is more evident in the female sex of *S. salina* than in the other forms or the male of the same species.

[27] In the majority of the species the interspace is strongly transverse in both sexes. The male of the genotypic species (*peragrans*) has this area less markedly transverse than in the other species examined.

The following are the more noteworthy features of the genotypic species drawn from the single individual now before me.

Scyllina peragrans (Stål) (Text-fig. 4; pl. III, figs. 1 and 2.)

1861. *Gomphocerus* (*Epacromia*) *peragrans* Stål, Kongl. Svenska Fregatten Eugenies Resa, Zool., I, 5, p. 343. [♂, ♀; Puna Island, Gulf of Guayaquil, Ecuador.]

♂; Puerto Grande, Puna Island, Gulf of Guayaquil, Ecuador. (F. Campos.) [Hebard Collection.]

Size relatively small, form slender, subcompressed; surface relatively smooth and subglabrous except from the pleura and much of the lateral lobes of the pronotum, which are obscurely impresso-punctulate. Head with exposed dorsal surface of same equal in length to four-fifths that of pronotal dorsum; fastigium as seen from dorsum with its greatest width but faintly greater than that of inter-ocular interspace, which latter is faintly less than one-fourth the width of the head across the eyes, excavation of fastigium shallow but definite, its cephalic border subacute-angulate, its caudal boundary transversely concave, the whole moderately transverse, the cephalic and lateral margins of the whole fastigium low carinate but marked: lateral foveolae small, impressed trapeziform, not sharply cut; fastigio-facial angle in profile well rounding to the definitely retreating, nearly straight oblique facial line; frontal costa dorsad at junction with fastigium no broader than one-third of interocular space, lateral margins of costa gently diverging ventrad, subobsolete in juxta-clypeal section, weak medio-longitudinal impression indicated briefly dorsad and ventrad of median ocellus; lateral facial carinae distinct, diverging, low and broad. Eyes but moderately prominent, not at all globose as seen from dorsum, in basal outline acute ovoid, greatest longitudinal dimension to greatest vertical depth as 4 to 5.5, length of infra-ocular sulcus subequal to half of eye depth. Antennae in length but very slightly less than three times that of the pronotal disk, terete, subdeplanate, particularly in proximal half, apex blunt.

Pronotum with greatest width across metazona of disk equal to three-fourths of the discal length, moderately strangulate, prozona and metazona subequal in length; cephalic margin of disk rounded obtuse, caudal margin much the same, but immediate angle more definitely rounded; median carina moderately elevated, cut only by principal sulcus; lateral carinae strongly cruciform, distinct except between the first and second transverse sulci where they are structurally subobsolete, the width between the inner borders of the carinae at the second transverse sulcus hardly one-third that between them at the caudal margin of the disk: lateral lobes of the pronotum with greatest median depth very faintly greater than the greatest dorsal length of the same, the cephalic and caudal margins slightly converging ventrad to the obtuse ventro-cephalic and ventro-caudal angles, the caudal margin very weakly sinuate, ventral margin quite definitely obtuse-angulate mesad.

Tegmina surpassing the abdominal apex by a distance subequal to the length of the pronotal disk, the greatest median tegminal width contained 5.8 in the tegminal length, the whole distal fifth appreciably but not strongly falcate recurved, apex narrowly rounded; costal margin with a quite low, broad lobation at proximal fourth, a gentle arcuation over median third, distad of which the margin is quite markedly arcuate to the apex; sutural margin faintly sigmoid: marginal field relatively broad, equal to three-elevenths of the whole tegminal width at middle of tegmen; anal field proximad slightly wider than median width of marginal field; mediastine vein marked, reaching costal margin at three-fifths of length of same from base; components of humeral trunk diverging faintly proximad of middle of tegmen; intercalary area irregularly bisareolate, without a true intercalary vein; ulnar area with a distinct and fairly continuous median adventitious vein; proximal axillary vein of anal field marked and appreciably elevated but only in proximal fifth of tegmen. Wings in repose reaching to tegminal apices, rather narrow, greatest breadth contained nearly twice in length, anterior field with apical outline much as apex of tegmen; areolation of anterior field largely elongate rectangulate.

Interspace between mesosternal lobes moderately transverse, greatest depth as to least width as 10 to 13, internal margin of lobes and meso-caudal angles regularly arcuate: metasternal lobes sharply and narrowly in contact caudad of the distinctly separated foveolae.

Ultimate tergite (supra-anal plate) subtrigonal, its median length and proximal width subequal, apex bluntly rounded, lateral converging margins subarcuate; surface of tergite with a premedian transverse sulcation, obsolete laterad, from which proximad extends a shallow and rather obscurely delimited medio-longitudinal impression, laterad in the same portion of the tergite is present on each side a sinuate intra-marginal sublamellate carinula. Cerci simple, faintly surpassing apex of ultimate tergite, styliform, apex bluntly acute. Ultimate sternite (subgenital plate) briefly and bluntly produced in dorsal, ventral and lateral aspects, dorsal margins briefly failing to reach apex and in lateral view largely straight.

Cephalic and median femora relatively slender. Caudal femora falling but faintly short of the tegminal apices, considerably inflated in the proximal half, the greatest depth there contained four and two-thirds times in the greatest femoral length, genicular lobes with ventral and distal margins forming segments of an elongate elliptical outline: caudal tibiae with ten external and eleven internal spines, external spurs of essentially similar length and curvature, internal spurs with shorter one equal to but five-eighths the length of the longer one, and lacking the definitely recurved, appreciably hooked character of the tip seen in the longer one. Caudal tarsi with third article but five-sevenths as long as the proximal one.

Coloration. General pale base color above ochraceous-buff, passing to light ochraceous-buff on abdomen and venter and pale cream color on face, lateral lobes of pronotum and much of limbs; darker pattern ranging from clove brown to mummy brown, this consisting of broad postocular bars on the head, which as narrow continuations run cephalad about the eyes above to the sides of the fastigium, and which on the pronotum are continued broadly, separated by a subequal continuation of the pale median head stripe and each obliquely bisected by the pale lining of the lateral carinae of the disk; the dark area on the lateral lobes covers much of the dorsal three-fourths of the same, the ventral border of the area with a Z-shaped outline and the dark section crossed obliquely in cephalic five-eighths by a pale bar, this becoming indefinite near the lateral carinae. Infra-ocular area of head briefly dark bilineate; pleura with oblique alternating pale and dark areas. Eyes buckthorn brown, obscurely multilineate with weak fuscous. Antennae pale proximad, becoming ochraceous-tawny distad. Tegmina with humeral trunk proximally dark pencilled, the intercalary area and distal half of the whole discoidal field with seven more or less sharply defined subquadrate to subrectangulate dark blotches, separated by clear areas usually broader than the blotches themselves; tegminal marginal field costad of mediastine vein and anal field clouded with darker, the mediastine-humeral interval clear and pale, forming a light humeral stripe. Wings hyaline except for a faint infuscate wash distad in the anterior and axillary fields, and the fuscous pencilling of the longitudinal venation of the anterior, axillary and first two elements of the radiate fields. Cephalic and median limbs weakly touched with fuscous. Caudal femora with dorsal half of both external and internal paginae with three obliquely disposed fuscous clouds, the more proximal the least extensive, the medio-dorsal carina bearing lineate sections of the same pattern, these, however, unconnected laterad with the paginal blotches; the entire genicular region of the caudal femora and the base of the caudal tibiae solidly and deeply infuscate; ventral sulcus of caudal femora deep colonial buff: caudal tibiae, except for dark base, and caudal tarsi chamois, spurs and spines tipped with blackish fuscous.

Length of body, 17.7 mm.; length of pronotum, 3.09; greatest (caudal) width of pronotal disk, 2.28; length of tegmen, 14.6; length of caudal femur, 12.

A restudy of the species originally referred by me to the genus *Scyllinops* [28] shows that certain of these should be removed to *Scyllina,* and *Scyllinops* narrowed down to the limits discussed on a following page. The species which I feel must be placed in *Scyllina,* with their approximate order and type localities are:

Scyllina salina (Bruner) [*Stirapleura salina* Bruner, 1905] (Salina Cruz, Mexico).

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[28] Trans. Amer. Entom. Soc., LIII, pp. 228-233, (1927).

Scyllina humilis (Blanchard) [*Oedipoda humilis* Blanchard, 1851] (Coquimbo, Chile).

Scyllina signatipennis (Blanchard) [*Oedipoda signatipennis* Blanchard, 1851] (Coquimbo, Chile).

Scyllina peragrans (Stål) [*Gomphocerus* (*Epacromia*) *peragrans* Stål, 1861] (Puna Island, Ecuador).

Scyllina variabilis (Bruner) [*Stirapleura variabilis.* Bruner, 1900] (Bahia Blanca and Pampa Central, Argentina).

Scyllina obscura (Bruner) [*Stirapleura obscura* Bruner, 1900] (Bahia Blanca, Argentina).

All of these species except the genotypic species *peragrans* were referred by me in 1927 to *Scyllinops,* two, i.e. *humilis* and *signatipennis* provisionally so, while the key then given pointed out one characteristic feature of *salina* which set it off from the other species then considered to belong to *Scyllinops.* For synonymy of and full bibliographic references to the species now transferred from *Scyllinops* to *Scyllina* reference should be made to my 1927 paper.[29]

One line of relationship of *Scyllina* is very definitely with the Nearctic genus *Psoloessa* Scudder, a dominant type over the Western United States and much of non-tropical Mexico.

Of the species of *Scyllina, salina* appears to be an annectant type, which on one hand agrees with true *Scyllina,* as represented by *peragrans,* and on the other shows definite affinity with *Rhammatocerus,* as exemplified by *R. viatorius.* In the bulk of its features it is nearer *peragrans,* but it clearly attests the relationship and similar origin of the two genera. As I do not know the female sex of *peragrans* I can compare *salina* with it only in features of the male.

The male of *salina* [30] has a more generally attenuate form than the same sex of *peragrans,* with less prominent eyes; the fastigium as seen from the dorsum is no broader but more deeply excavate caudad to the usual transverse arcuate impression, the lateral borders of the same are inbent caudad, partially enclosing the fastigial area, and the interocular width of the vertex is thus less than the greatest fastigial width, while in *peragrans* these are subequal; the least dorsal width of the frontal costa is subequal to the width of the proximal antennal article, the whole frontal costa is transversely subconvex, as in *Rhammatocerus,* rather than definitely deplanate as in *S. peragrans.* The disk of the pronotum is proportionately longer than in *peragrans* and the caudal margin is more produced obtuse-angulate, while the lateral lobes are very similar except that the caudal margin is more appreciably concave. On the tegmina the mediastine vein in *salina* reaches the costal margin definitely distad of the middle of the tegmen instead of proximad of the same as in *peragrans,* while the prehumeral accessory veins of the tegmina are more numerous and more strongly sigmoid. The male ultimate tergite (supra-anal plate) of *salina* is more elongate and subacute than in *peragrans,* which has this tergite relatively broad.

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[29] Trans. Amer. Entom. Soc., LIII, pp. 230-231, (1927).

[30] I have used for comparison the allotypic male of the synonymic *Stirapleura meridionalis* Bruner, from Salina Cruz, Mexico, in the Hebard Collection.

The limited known series of *S. salina* shows such a range in color pattern and tone that comments on this angle of difference from the single male of *peragrans* would be of little value. Larger series of both species must be in hand to make such remarks of any permanence.

SCYLLINOPS Rehn

1927. *Scyllinops* Rehn, Trans. Amer. Entom. Soc., LIII, p. 228. (Genotype (by original designation): *Scyllinops bruneri* (Rehn)).

The comments made on this genus at the time of its description require modification in some respects and the concept of the scope of the genus as held at that time should be revised, as on a preceding page I have removed five of the originally included species to the genus *Scyllina.* As now delimited the present genus comprises *Scyllinops bruneri* (Rehn) (the genotype), *Scyllinops pallida* (Bruner) and *S. liebermanni,* here described.

One distinctive feature of *Scyllinops* as here restricted is the marked inflation of the cephalic and median femora in the male sex. This feature was not stressed at the time the genus was described, as forms lacking this development were then regarded as congeneric. The interspace between the mesosternal lobes in the male sex is much less strongly transverse than in *Scyllina,* ranging from subquadrate (*pallida*) to moderately transverse (*liebermanni*) while the mesosternal lobes in the same sex are definitely attingent caudad, instead of being narrowly separated as in males of *Scyllina*. The genicular lobes of the caudal femora in both sexes are larger and deeper and more broadly arcuate at their distal margin than in *Scyllina*. In all the species here referred to *Scyllina* there is a greater degree of concavity of the caudal margin of the lateral lobes of the pronotum in both sexes, than in those here placed in *Scyllinops*.

While on one hand *Scyllinops* is intimately related to *Scyllina* and *Rhammatocerus*, on the other it is clearly close in affinity to the genus *Borellia* Rehn, 1906,[31] described from Matto Grosso, Brazil. This genus when characterized was referred to the gomphocerine section of the subfamily, as the internal paired tibial spurs are not strongly dissimilar in length. It is now evident that while these spurs are less unequal than in *Scyllinops*, this is more truly a matter of degree rather than of fundamental difference. In *Borellia*, however, the frontal costa has definite carinate lateral margins elevated above the level of the median costal surface and continuous dorsad to the extreme apex of the fastigium, instead of without these as in *Scyllinops*; the lateral fastigial foveolae are longer, narrower and distinctly deeper and more sharply defined than in *Scyllinops;* the fastigium, in the female at least, is broader with a more narrowly lunate transverse impression; the pronotum is less definitely strangulate and the weaker lateral carinae of the same are less cruciform. The male sex of *Borellia* has the cephalic and median femora inflated as in *Scyllinops*, and the sternal interspaces are also as in the latter genus. I am here figuring a paratypic female (see text-fig. 9; pl. III, figs. 3 and 4) of the previously unfigured *Borellia carinata* Rehn.

It is probable that a linear arrangement of these related South American genera would logically present their sequence as *Borellia, Scyllinops, Scyllina* and *Rhammatocerus*, although the steps in the line are by no means equal, and the clearest picture will be secured only after a full restudy of the varied species now referred to *Rhammatocerus*. It is clear that the nearest affinity of *Cauratettix* Roberts,[32] from Venezuela, is with *Rhammatocerus*, of which stock it is a distinctively modified and well defined off-shoot.

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[31] Proc., U. S. Nat. Mus., xxx, p. 379, (1906). Genotype (by original designation): *B. carinata* Rehn.

As to the identity of *Scyllinops* Rehn with the Old World genus *Aulacobothrus* I. Bolívar,[33] which has been assumed by Uvarov,[34] I would refer to my very recent paper, in which this matter is rather fully discussed,[35] although the present observations supplement and amplify certain conclusions there expressed. When examined anew, the genotype of *Aulacobothrus*, i. e. *A. strictus*, seems to be nearer in relationship to *Euplectrotettix* Bruner, 1900,[36] than it is to any other New World genus. The two agree in numerous features but differ in others, as the character of the dorsal part of the frontal costa, the proportions of the mesosternal interspace, arrangement of the supplementary tegminal venation, the form of the lateral lobes of the pronotum and the marked difference in length of the internal caudal tibial spurs. While these characters are largely ones of degree they have been found of value in separating many related genera, and on the basis of the genotypic species the two are well distinct. If, however, the future should show sufficient instability in these and other features in the various species of the respective genera to make their separation illogical, Bruner's name is the older, and it would require consideration in any discussion of the Old World forms currently assigned to *Aulacobothrus*.

The following new species has already been referred to on a preceding page.

Scyllinops liebermanni[37] new species

(Text-figs. 7 and 8; pl. III, figs. 9-12.)

Closely related to *S. bruneri* (Rehn) of the eastern Pampas of Argentina (see text-figs. 5 and 6; pl. III, figs. 5-8), but differing in both sexes in the broader, less sharply angulate fastigium and fastigial impression as seen from dorsum, appreciably broader head, particularly across the genae, more transverse interspace between the mesosternal lobes, and in the male the more blunted and less distinctly acuminate subconical ultimate sternite (subgenital plate).

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[32] Proc. Acad. Nat. Sci. Phila., LXXXIX, p. 349 (1937). Genotype (by original designation): *C. gracilis* Roberts.

[33] Ann. Soc. Entom. France, LXX, p. 597, (1902). Genotype (by selection of Kirby, 1910): *A. strictus* I. Bolívar.

[34] Revista Soc. Entom. Argentina, IX, pp. 3-5, (1937).

[35] Revista Soc. Entom. Argentina, X, pp. 115-123, (1939).

[36] Second Rep. Merchants' Loc. Invest. Comm. Buenos Aires, pp. 23 and 38, (1900). Genotype (by selection of Rehn, 1906): *E. ferrugineus* Bruner.

[37] Dedicated to my colleague Dr. José Liebermann, of Buenos Aires, Argentina, whose numerous investigations are adding materially to our knowledge of the Orthoptera of Argentina.

Type.—♀; Neuquen,[38] Argentina, 1907. (Dr. Lendl Adolf.) [Hebard Collection, Type no. 1349.]

Size relatively large (for genus); form moderately robust.

Head appreciably inflated, as seen from dorsum and in lateral and cephalic aspects, the occipital line in profile distinctly arcuate and slightly descending cephalad to fastigial disk, instead of evenly ascending to same as in *S. bruneri*, in cephalic aspect the head across the genae is equal to 1.2 times that across eyes, as against 1.08 in the type of *bruneri*, the outline of the genae in the same view more definitely inflated while the eyes are no more evident; fastigium as seen from dorsum with greatest width across the lateral margins of the impression equal to slightly more than one and two-fifths times the medio-longitudinal length of the fastigial excavation, instead of but slightly more than one and one-tenth times, as in the type of *S. bruneri*; carinae bordering fastigial impression cephalad rectangulate, the impression strongly transverse, weak traces of a medio-longitudinal carina on occiput only; lateral foveolae quite elongate rectangulate, moderately excavate; in profile fastigio-facial angle more rounded, as seen in profile, than in *bruneri*; frontal costa essentially as in *bruneri*. Antennae as in *bruneri*. Eyes as a whole slightly smaller than in *bruneri*.

Pronotum slightly broader and more robust than in *bruneri*, details in most instances as in that species; lateral lobes of pronotum less markedly narrowing ventrad.

Tegmina briefly surpassing the apices of the caudal femora;[39] shape of tegmina, character of fields and venation as in *S. bruneri*.

Interspace between mesosternal lobes definitely transverse, its least width to greatest depth as 8 to 5, internal margin of lobes markedly convex, caudal margin of lobes subtruncately transverse: metasternal lobes separated by a subquadrate cuneate interspace, caudal margin of lobes broadly and evenly convex.

Apex of abdomen as in *S. bruneri* except that the ovipositor valves are shorter and stouter, in profile the lower ones particularly are more sharply falcate: ultimate sternite (subgenital plate) with the median angulate production of its distal margin broader and less lanceolate acute, the lateral bordering acute emarginations of the same margins broader and more nearly approaching rectangulations than in *S. bruneri.*

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[38] I do not know whether this locality refers merely to the territory or to the specific settlement of Neuquen within the same.

[39] In the paratypic females the tegminal apices reach but do not surpass the femora.

Caudal femora and tibiae as in *S. bruneri,* the latter with ten external and ten to eleven internal spines; tibial spurs and proportions of caudal tarsal articles as in *S. bruneri.*

Allotype.—♂; same data as type. (Hebard Collection.)

Differing from the description of the female type of the species, and the allotype of the related *S. bruneri* in the following noteworthy features.

Size but little less than that of the female sex, very definitely larger than the male allotype of *S. bruneri;* form definitely more slender and less robust than in female type.

Head less inflated than in female, but distinctly more so than in the male of *bruneri,* the eyes much less prominent than in the latter and approximately subequal in this respect to the condition seen in the female sex, outline of head in profile as in the female, but facial line more strongly retreating, in cephalic aspect the head across the genae is equal to one and one-eighth times that across eyes, as against subequal width in the male of *S. bruneri,* the outline of the genae and eyes in the same aspect as in the female, instead of the eyes being definitely fuller, as in the male of *bruneri*: fastigium as seen from dorsum with greater width across the lateral margins of the impression equal to slightly less than one and one-fourth times the medio-longitudinal length of the fastigial excavation, instead of one and seven-tenths times the median length as in the male of *bruneri*: general outline of fastigial carinae, as seen from dorsum, as in female; frontal costa in cephalic view and fastigio-facial angle in profile as in female sex.

Pronotum as in female but narrower, although no more strongly strangulate; lateral lobes slightly more longitudinal and not as deep proportionately as in the female sex.

Tegmina essentially as in female sex.

Interspace between mesosternal lobes slightly transverse, its least width to greatest depth as 8.5 to 7, internal margin of lobes weakly arcuate, caudal margin of lobes slightly oblique subtruncate: metasternal lobes nearly but not quite attingent caudad of the foveolae, caudal margin of lobes with an obtuse-angulate median break to a general arcuation.

Apex of abdomen in general as in the male sex of *S. bruneri* but ultimate sternite (subgenital plate) less conical, the whole being stouter, blunter and less compressed, in lateral aspect the immediate apex rounded rectangulate instead of definitely subacute.

Limbs as in female sex and in *S. bruneri.*

Coloration.—Pale base color ranging from ochraceous-buff to pale ochraceous-buff, rarely with a slight ochraceous-salmon tinge, and areally at times as faintly tinted with olive-ocher; dark pattern cinnamon-brown, on the pronotal dorsum in the vicinity of the pale cruciform lateral carinae heavily infuscate with mummy brown. Head with occiput and fastigium usually with paired caudad diverging dark bars—subobsolete in one and weak in another female paratype—extending caudad from the lateral foveolae, their external borders finely edged with velvety mummy brown, this also narrowly infuscating the contiguous eye surface; subvertical infra-ocular dark bar usually marked—lacking in those females with subobsolete or weak dorsal bars—, face otherwise generally uniform, but in two intensively colored females the area of the frontal costa, except for pale marginal carinal lines, is definitely or weakly (type) infuscate with cinnamon brown, faint indications of this condition also to be seen in several of the males (including the allotype). Eyes ranging from buckthorn brown to mottled bister. Antennae snuff brown. Pronotum with pale medio-longitudinal bar, continuing that of head, always marked, of uniform width, the dark lateral areas fluctuating in tonal depth, relieved by darker velvety pencilling about the pale cruciform lineations of the lateral carinae, which are usually, but not invariably, interrupted in the middle of the pronotum; lateral lobes with a longitudinal pale bar of variable strength, completeness and outline crossing the middle of the lobes, relieved dorsad and ventrad by equally variable velvety mummy brown borderings. Tegmina with anal field pale, a definite humeral stripe of greenish white indicated in the proximal half, discoidal field with five to eight spaced, generally subquadrate or subrectangulate, dark blotches. Caudal femora with dorsal surface ranging from pale immaculate to definite transverse bifasciate with dark, genicular region darker, the genicular arches deep blackish fuscous, genicular lobes sprinkled with fine dots of cinnamon-brown; external pagina often marked with russet, again immaculate; caudal tibiae ranging from glaucous green to almost cinnamon-buff, obscurely speckled with brownish, spines and spurs whitish buff with fuscous-black tips.

Measurements in (millimeters)

	Length of body	Length of pronotum	Greatest (caudal) width of pronotal disk	Length of tegmen	Length of caudal femur
♂, allotype	20.2	3.91	2.60	17.1	11.7
♂, paratype	18.5	3.91	2.77	15.6	10.7
♂, allotype of *S. bruneri*, Carcarañá, Argentina ...	14	3.09	2.11	12.2	9.4
♀, type	21.1	4.40	3.42	19	13.5
♀, paratype	22	4.56	3.42	17.1	14
♀, type of *S. bruneri*, Carcarañá, Argentina ...	21	4.40	3.09	16.1	13.6

In addition to the type and allotype I have before me three males and three female paratypes bearing the same data as the type, and in the Hebard Collection and that of the Academy of

Natural Sciences of Philadelphia. One male is interesting in that its fastigium is slightly more acute in dorsal view than in the other individuals, thus suggesting *S. bruneri*, from which, however, the lesser prominence of the eyes, their smaller size, the character of the fastigio-facial angle and the degree of obliquity of the facial line all distinguish it.

Apparently *S. liebermanni* is the form of the *bruneri* group of the genus found in the zoologically poorly known Neuquen Province. Doubtless numerous other species of localized distribution will be encountered in this territory as our knowledge becomes more extensive.

PROBABLE HISTORY OF THE GENERA

Apparently *Scyllina* is the oldest of the genera involved in the present discussion, having as it does a great amount of structural diversity in its various species, as well as the most significant distribution. The species of that genus occur in areas extending from the Tehuantepec region of southern Mexico to central Argentina and south-central Chile. As far as present information goes gaps exist in the continuity of this distribution in two broad sections, i. e. first, Central America south of Tehuantepec and northwestern South America to the Guayaquil region, and second, from the latter area to north-central Chile and northern Argentina. Whether the genus is continuously present over these apparent gaps, and that these exist solely through the imperfect character of past collecting, only future work will determine, also whether the genus occurs in the more elevated Venezuelan and Guianan interior or on the east Brazilian plateau. It apparently is absent from the great Guianan and Amazonian humid tropical province.

As far as at present known *Scyllinops*, as here redefined, is Argentinian, and *Borellia* occurs in the central areas of Matto Grosso, Brazil, and I now also know it from eastern Bolivia. This would point to a somewhat similar history for these two genera, probably developed from an older, more generalized yet plastic stock like *Scyllina*. The presence of the latter in Chile points to relative antiquity, doubtless pre-Pleistocene in that portion of South America, and the absence of *Scyllinops* similarly would indicate the greater youth of the latter genus. The occurrence of *Scyllina* north of the Isthmus of Panama points to Pliocene times as the earliest in which would have been possible continuous occurrence within the present generic range. There is no means of determining whether the present outside limits of distribution were established so early, or represent more recent extensions one way or the other over the Panama land bridge. Certainly, however, the apparent gaps in continuity of present day distribution must in part at least reflect the actual absence or at most localization of the genus in these areas. Hence the periphery of the distribution in all probability was established a considerable time past, and the isolation of certain species, where complete, as far as existing information is concerned, is due to more recent factors, perhaps the marked disturbance of temperature and humidity in Pleistocene times.

The center of greatest differentiation of *Scyllina* is clearly Chilean and Argentinian, and it is in adjacent territories of the Atlantic drainage where the related *Scyllinops* and *Borellia* have developed and probably since the Pliocene completion of the Andean uplift. It seems warranted to conclude that first *Scyllina,* and secondarily the derived *Scyllinops* and *Borellia,* originated in the southern half of South America, the former developing much of its radiative evolution before the rising Andes separated the Argentinian and Chilean elements of the genus. At the Pliocene peak the genus doubtless spread northward along western South America, over Panama, and as far as the region of the Tehuantepec portal, which according to responsible historical geologists was not closed until late Pliocene times. North of this the genus is not at present known. The breaks in its distribution are in considerable part paralleled by what has already been emphasized by me in discussing the South and Central American distribution of *Trimerotropis.*[40]

The genus *Rhammatocerus* shows even more marked interspecific differentiation than *Scyllina* and its distribution is more extensive except it is not known from Chile. It is broadly distributed over most of South America south to Central Argentina, except Chile as remarked above, avoiding heavy forest and prefering grass savanna or brush land, reaching to considerable elevations in districts such as Colombia. North of Panama it extends to Lower California and the extreme southwestern part of the United States, there being definitely intrusive from Mexico. Its greatest existing diversity is found in southern interior Brazil and adjacent Paraguay, and continentally north of Panama apparently but a single one of the various lines of the genus has intruded. Doubtless its presence in most of Mexico is recent, certainly since late Pliocene times on account of the Tehuantepec portal. In consequence it would appear logical to assume that the genus, along with the others here discussed, originated in the southern half of South America and it, with *Scyllina,* invaded Central America and Mexico, probably in the Pliocene, *Rhammatocerus* as the more adaptable type having retained its relatively continuous distribution, and more effectively resisted eliminating factors in the Pleistocene, which latter may have produced the present spotty occurrence of *Scyllina.*

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[40] Trans. Amer. Entom. Soc., LXV, pp. 412-414, (1940).

Explanation of Plate III

(All figures twice natural size)

Fig. 1—*Scyllina peragrans* (Stål). Male. Puerto Grande, Puna Island, Gulf of Guayaquil, Ecuador. Lateral view.

Fig. 2—Same. Dorsal view.

Fig. 3.—*Borellia carinata* Rehn. Female (paratype). Chapada, Matto Grosso, Brazil. Lateral view.

Fig. 4.—Same. Dorsal view.

Fig. 5.—*Scyllinops bruneri* (Rehn). Female (type). Carcaraña, Argentina. Lateral view.

Fig. 6.—Same. Dorsal view.

Fig. 7—*Scyllinops bruneri* (Rehn). Male (allotype). Carcaraña, Argentina. Lateral view.

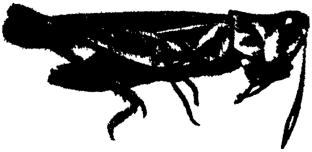
Fig. 8—Same. Dorsal view.

Fig. 9—*Scyllinops liebermanni* new species. Female (type). Neuquen, Argentina. Lateral view.

Fig. 10.—Same. Dorsal view.

Fig. 11.—*Scyllinops liebermanni* new species. Male (allotype). Neuquen, Argentina. Lateral view.

Fig. 12—Same. Dorsal view.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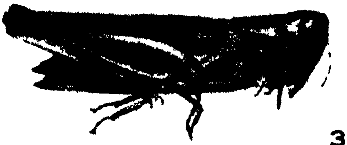
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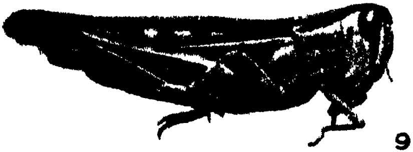
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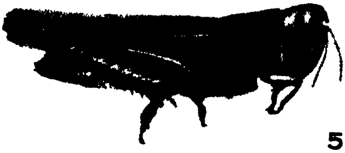
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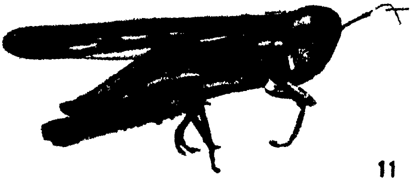
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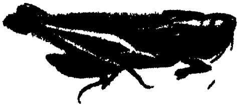
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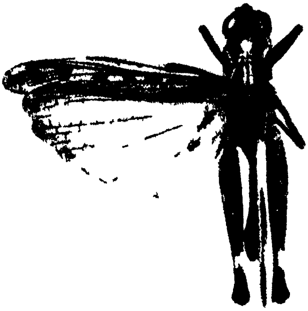
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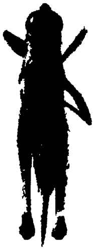
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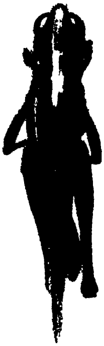
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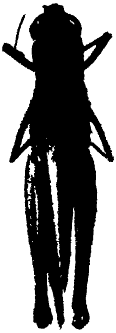
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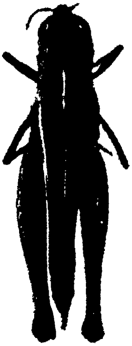
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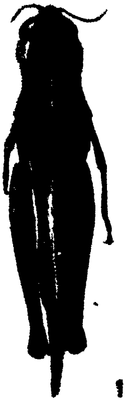
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REHN—SCYLLINA and SCYLLINOPS

NEW NEOTROPICAL HESPERIIDAE AND NOTES ON OTHERS

(LEPIDOPTERA)

BY R. C. WILLIAMS, JR. AND ERNEST L. BELL

(Nineteen text-figures)

The specimens which form the basis of the following descriptions are, for the most part, from the collection of the Academy of Natural Sciences of Philadelphia, the balance of them from the collection of the American Museum of Natural History of New York City. The exact location of the type material is stated under each description.

Ocyba sula new species (Fig. 1.)

This species differs from *calanus* Godman and Salvin and *calathana* Hewitson in having the outer margin of the secondaries much straighter and the anal angle more pointed, in the primaries being less truncate at the apex, in the total absence of the dark bands of the primaries and only a very hazy suggestion of one on the secondaries, in having brown instead of fulvous fringes and no fulvous area on the outer margin of the secondaries.

Male. Upper side. Primaries dark coppery brown shading to dark fulvous at the base. Fringes blackish brown. Costal fold present. Secondaries same color as primaries, basal two-thirds covered with dark fulvous hairs. From vein 8 to costal margin glabrous, a short very heavy, dark brown hair tuft from near the base of vein 7 stands out with great distinctness. Dense, long brown hairs along the abdominal fold. A very hazy indication of a darker discal band. Fringes blackish brown.

Beneath dark coppery brown. Primaries with the apex slightly paler and a few bluish green hairs in the base of the cell. A large glabrous area occupies nearly all of the inner margin below vein 1 and a little more than the basal half of interspace 1. Vein 1 is greatly curved upward in the basal third and at the top of this curve is swollen and scaleless.

Secondaries same color as primaries, with some bluish green hairs at the base of the cell. Fringes dark brown.

Top of palpi and head brown with greenish hairs, collar and shoulder covers brown, thorax with long bright fulvous hairs at the base, tegulae bright fulvous, abdomen fulvous. Beneath palpi brown, pectus greenish brown, thorax and abdomen with brown and bluish green hairs. Legs coppery brown. Antennae black above, beneath the basal half lightly spotted with brown, from there to the club brown, the club black, the apiculus brown.

Expanse: 43 mm.

Type material.—Holotype, male; San Pedro Sula, Honduras; [collection of Academy of Natural Sciences of Philadelphia].

The form of the genitalia is similar to that of *calanus* but differs in detail. The uncus terminates in two arms, slightly curved and pointed at the apex and there is a tuft of long black hair spines from the dorsal side. The scaphium is small. The claspers curve upward toward the apex, which is hooked backward and with numerous serrations. The aedoeagus is very stout and carries a few large and some small internal spines.

Eracon (?) **problematica** new species (Fig. 2.)

The maculation of this insect is much like that of *Cyclosemia* but the primaries are more pointed at the apex and the secondaries much more elongate than in that genus. The presence of the costal fold and the absence of the tibial tuft disagrees with the diagnosis of the genus *Eracon* but this does not seem to be of sufficient importance to necessitate a separate genus for *problematica*. *Problematica* above somewhat resembles *biternata*, the primaries being a little more pointed at the apex, the ground color paler, no hyaline spot above the cell, but the underside of both wings is quite different.

Male. Upper side. Primaries light brown, a band of darker brown spots between the veins, beginning before the apex and curving outward almost to the margin of the wing and extending to vein 1, the spots above vein 4 smaller than those below it, the two spots between veins 2 and 4 the larger, the spot below vein 2 narrow. A narrow, irregular dark band curving outward beyond the end of the cell, then under it to the base of interspace 3, then curving outward across interspaces 2 and 1. The base of the wings is dark. A narrow vertical bar at the end of the cell and in the outer half of the cell a black spot occupying the entire width of the cell and longer than broad, slightly indented on the outer edge, with two small hyaline spots, one in the upper and one in the lower outer corners. The cell and just beyond it is a trifle paler than the other pale areas of the wing. Under the black spot in the cell, in interspace 2, is a small dark brown dash slanting obliquely inward. Three small hyaline subapical spots lie in the second of the dark bands in interspaces 6, 7 and 8, the middle one placed inwardly of the other two. A costal fold is present. Fringes brown.

Secondaries elongate, the outer margin slightly excavate between veins 4 and 7. Same color as primaries. A moderately broad dark brown marginal band with small, rather indistinct darker, brown spots between the veins, an irregularly curved discal band beginning on vein 7 and extending to the abdominal fold, the part of the band above vein 4 is narrow and spot like, below that vein it widens out. A narrow dark bar across the end of the cell. Base and abdominal fold dark.

Beneath. Primaries grayish white with the bands, black cell spot and all the hyaline spots repeated. Secondaries with the marginal dark band as above, the darker spots between the veins a little more prominent, the discal band also present. Between the marginal and discal bands and from the discal band to the base overscaled with pale blue and bluish white but leaving a brown spot above the cell and all of the costal area except the base brown.

Top of palpi, head, collar and shoulder covers brown with some pale yellow hairs. Thorax above, tegulae, abdomen brown. Beneath palpi yellowish white, pectus gray, thorax with bluish white hairs, abdomen pale blue. The antennae are nearly all broken off but what is left is black on both sides.

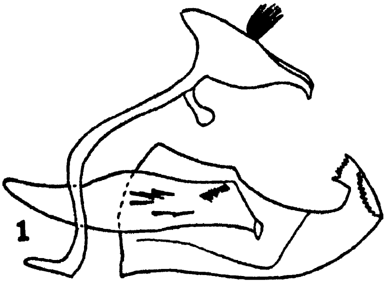
Expanse: 31 mm.

Type material.—Holotype, male; Argentina; [collection of the American Museum of Natural History].

The uncus is rather short and pointed. A narrow scaphium extends downward and then outward. The upper lobe of the claspers is very short with a stout tooth at the dorsal corner of the apex, the lower lobe is triangular with numerous small serrations at the apex. The aedoeagus is stout and has a cluster of internal spines in the center.

Pellicia pollardi new species (Fig. 3.)

Pollardi belongs to the *macarius* group of *Pellicia* and resembles *ephora* Herrich-Schaffer in the general appearance and position of the subapical spots but differs materially in the male genitalia especially in the scaphium and termination of the claspers.



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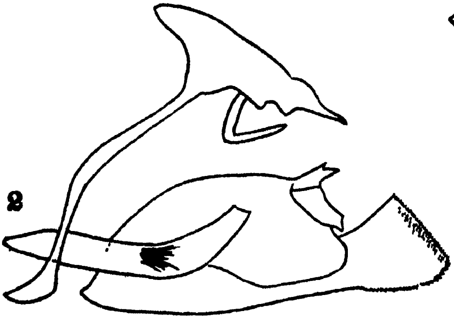

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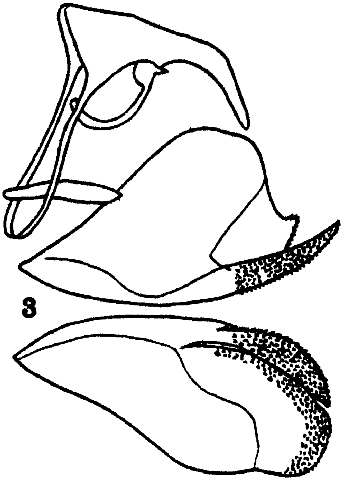

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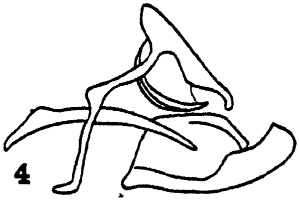

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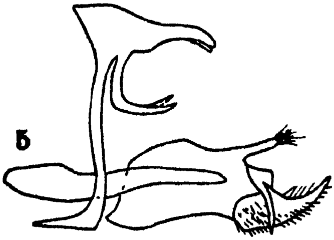

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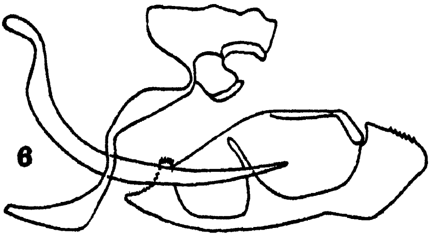

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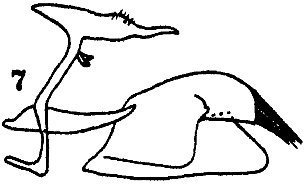

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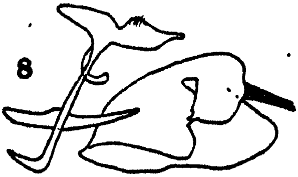

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Male. Upper side blackish brown, with the usual indistinct darker bands and concolorous fringes on both wings. Primaries with three, small hyaline subapical spots in interspaces 6, 7 and 8, that in 7 placed basad of the other two.

Secondaries with a very long, brown hairtuft from the base of the costal margin.

Beneath paler. Primaries with the inner marginal area broadly paler than the rest of the wings, a small pale spot at the apex, subapical spots repeated, submarginal dark band repeated and a broad dark band running downward from the subapical spots but not crossing the pale inner marginal area. Secondaries with the dark bands more distinct.

Body, head and palpi above dark brown, beneath thorax, palpi and pectus brown, abdomen paler brown. Antennae above blackish; beneath brown, the club paler.

Expanse: 31 mm.

Type material.—Holotype, male; British *Guiana;* [collection of American Museum of Natural History].

Named for Mr. C. L. Pollard, who collected the specimen.

The uncus is of the usual form of the *macarius* group. The scaphium is developed and similar in form to that of *brunneata* Williams & Bell and *potera* Williams & Bell and of much the same form as that of *macarius* Herrich-Schaffer, from all three of which *pollardi* differs in the termination of the claspers.

Cyclosemia pedro new species (Fig. 4.)

This insect has the appearance of a small *anastomosis* Mabille but it has no suggestion of blue or whitish on the under side of the secondaries and the details of the genitalia are different from those of *anastomosis.*

Male. Upper side. Primaries brown, a slightly darker brown band from the costal margin curving around the end of the cell and extending to vein 1, another similar and parallel submarginal band, both of these bands are more or less composed of separate spots between the veins. A large black spot occupies the end of the cell and has two white dots, one each in the upper and lower corners of the outer side, the lower spot the larger. Fringes concolorous.

Secondaries brown with three slightly darker bands, the first subbasal, the second discal and the third submarginal. Fringes concolorous.

Beneath much paler than above. On the primaries the black cell spot of the upper side is here but little darker brown than the rest of the wing and thus less distinct than above, the two white dots are repeated. The darker bands of both wings are repeated.

Top of head, palpi, collar and shoulder covers are brown with a few pale yellowish hairs. Tegulae, thorax and abdomen above are brown. Palpi beneath yellowish white, pectus gray, thorax and abdomen gray. Antennae above black, beneath pale brownish.

Expanse: 26 mm.

Type material.—Holotype, male; San Pedro, Honduras; [collection of Academy of Natural Sciences of Philadelphia].

Anastrus niger Rober

1927. Intern. Entom. Zeit., xx, p. 428. [Sierra de Sta. Marta, Colombia.]

The description of *niger* entirely agrees with *lacydus* Druce which is the male of *Hyalothyrus neleus* Linnaeus and therefor a synonym of *neleus,* so *niger* also falls as a synonym of *neleus.*

Celaenorrhinus approximatus new species (Fig. 5.)

This species resembles *eligius* Cramer and it is doubtful that it can be accurately separated from that species on the superficial characters alone, however, the form of the male genitalia differs sufficiently to separate the two species.

Male. Upper side. Both wings brown. Primaries with an oblique discal band of six white hyaline spots, as follows: one, oblong, on the costal margin, a large one in the cell, the upper half of which is shorter than the lower half on the outer edge, a small one near the base of interspace 3, a large one in interspace 2, the inner side excavate, the upper side shorter than the lower, two small ones in interspace 1, the upper one slightly the larger and the lower one a little inward of the upper one. Three elongate, white hyaline subapical spots in an oblique line outward. A very minute white dot in the center of interspace 4 and another still smaller one above it in interspace 5, below the outer tip of the lowest subapical spot, both of these dots are very indistinct. Fringes brown.

Secondaries. A narrow yellow bar across the end of the cell and a small yellow spot above the basal third of vein 7. A hazy indication of a curved submarginal band of pale spots. The outer margin of these wings is produced outward, lobe like, between veins 2 and 6.

Beneath brown. Primaries with the spots of the upper side repeated. Secondaries with the two spots of the upper side repeated and a small, ha[illegible] one below vein 2 a little beyond the base, a hazy indication of a curved submarginal band of pale spots, a light overscaling of yellowish in the lower half of the wings, especially at the base and in the abdominal fold.

Top of palpi, head, collar, shoulder cover, thorax and abdomen brown with a slight greenish reflection on the head and collar. Palpi beneath white, pectus grayish, abdomen brown edged paler on the segments. Antennae above blackish, beneath a small gray spot below the base of the club and one at the base of the apiculus, sides of the club reddish.

Female. Similar to the male, slightly larger, all the hyaline spots larger, the two below the subapical spots much more evident. On the secondaries the two yellow spots are less distinct. Beneath the primaries are as above and a pale marginal spot between veins 1 and 2 and a hazy indication of pale marginal spots above vein 2. On the secondaries the two yellow spots are a little plainer than above and the submarginal band of small yellowish spots is also a little plainer, especially the lower ones.

Expanse: male 39 mm.; female 41 mm.

Type material.—Holotype male and allotype female; Costa Rica; [collection of Academy of Natural Sciences of Philadelphia].

In *eligius* the terminal arm of the claspers is broad with the apex produced into a small upturned hook, in *approximatus* the terminal arm is long and narrow, tapering gradually to a sharp point. From the base of the terminal arm a long, thin, toothlike process projects obliquely downward from the dorsal edge and extends a little beyond the ventral edge of the arm, a character entirely lacking in *eligius* or any of the other allied species with which we are familiar.

Ebrietas niger new species (Fig. 6.)

This insect differs from the other members of the genus in lacking definite maculation on the upper side of the wings and its very black appearance.

Male. Upper side. Both wings deep blackish brown, with a hazy indication of submarginal and discal bands on the primaries and discal and subbasal bands on the secondaries. A costal gold is present on the primaries. Fringes of both wings concolorous.

Beneath. Primaries and the costal half of the secondaries a little paler than above, inner margin of primaries narrowly paler brown. Anal half of the secondaries shading paler brown downward, a submarginal band of pale spots between the veins.

Palpi, head, collar, shoulder covers, tegulae, thorax and abdomen above dark brown. Palpi, thorax and abdomen beneath dark brown. Antennae mostly missing but what is left of them is black. No tibial tuft.

Expanse: 39 mm.

Type material.—Holotype male and one male paratype; Muzo, Colombia; [collection of Academy of Natural Sciences of Philadelphia].

The uncus is divided into two arms blunt at the apex. The scaphium is short and broad. The claspers slant obliquely upward at the apex, which is broad and has a few serrations. There is a long internal tooth near the center of the disc and a shorter one at the base and this has a few small teeth on the basal side and at the apex. The aedoeagus is extremely long and thin.

Pholisora aurocapilla (Staudinger) (Fig. 7.)

1876 (1875). *Helias aurocapilla* Staudinger, Verh. k.-k. zool.-bot. Ges. Wien, xxv, p. 117. [Buenos Ayres.]

1896. *Staphylus aurocapilla* Godman and Salvin, Biol. Centr.-Amer., Rhop., II, p. 431; pl. 89, figs. 9-11.

The figure of the male genitalia given by Godman and Salvin lacks certain details which they mention in the text. We refigure the male genitalia to show the missing details as they are important in the separation of *aurocapilla* from other closely allied species having a very similar superficial appearance and a very similar form of the male genitalia.

The uncus is rather long and has some dorsal hair-like spines near the base. A weak scaphium is present. The dorsal edge of the claspers is somewhat convex and the upper lobe has a small tooth in the lower corner of the base and at the apex carries a large cluster of heavy spines projecting slantingly downward.

Pholisora sinepunctis (Kaye) (Fig. 8.)

1904. *Staphylus sinepunctis* Kaye, Trans. Ent. Soc. London, p. 215. [St. Ann's Valley, Trinidad.]

This insect is closely allied to *aurocapilla* Staudinger. Specimens from Trinidad show the paler anal area of the secondaries beneath but a male from Venezuela lacks this character, the secondaries being uniformly dark beneath. While the majority of specimens from Trinidad have no subapical spots occasionally there are individuals showing minute traces of them.

The uncus is short with short dorsal hair-like spines near the base. A weak scaphium is present. The dorsal edge of the claspers curves upward from the base to the apex of the upper lobe. The apex of the upper lobe is slightly irregular in shape and carries a cluster of long spines projecting obliquely downward. At the base of the upper lobe there is a stout tooth in the lower corner.

Pholisora caribbea new species (Fig. 9.)

This insect has much the appearance of *Pholisora aurocapilla* Staudinger and like that species the golden scales on the top of the palpi, head, collar and shoulder covers. The form of the male genitalia shows that *caribbea* is specifically distinct from *aurocapilla.*

Male. Upper side. Primaries dark brown sparsely overscaled with sordid yellowish. A narrow, curved, paler submarginal line from the costa to the inner margin and another similar line paralleling it inwardly and crossing the end of the cell, both of these lines vary in distinctness and in some individuals are barely visible. Usually there are three minute, hyaline subapical dots in interspaces 6, 7, and 8 but sometimes the two lower ones may be absent. A minute white dot is sometimes present near the base of interspace 3, below and just beyond the end of the cell but this dot is usually absent. A costal fold is present. Fringes slightly paler.

Secondaries. Same color as primaries and sparsely overscaled with sordid yellowish. Two narrow, pale bands similar to those on the primaries. Fringes slightly paler. The outer margin of the wings is slightly excavate between veins 4 and 6.

Beneath. Paler than above. On the primaries the outer and inner margins are paler than the rest of the wing. The inner of the two pale bands shows as a pale streak in the end of the cell, the subapical dots and the dot in interspace 3, when present, are repeated. A very thin overscaling of sordid yellowish toward the outer margin which may be absent if the specimen is worn. On the secondaries the pale bands are repeated in hazy paler spots, sometimes the inner one is merely represented as a spot in the end of the cell. An overscaling of sordid yellowish.

Top of head, palpi, shoulder covers black with golden scales. Thorax above dark brown, beneath paler. Tegulae dark brown. Abdomen above dark brown with scattered yellow scales, beneath paler brown with sordid whitish scales. Palpi beneath yellowish. Pectus grayish. Antennae above black, beneath spotted with yellow, the club yellowish.

Female. Similar to the male, slightly paler and more heavily over-scaled with sordid yellowish.

Expanse: male 24-26 mm.; female 25-26 mm.

Type material.—Holotype male and allotype female; Barro Colorado Island, Canal Zone, Panama. Paratypes: 8 males, 1 female; Barro Colorado Island. 2 males, 1 female; Tapia Bridge, Panama. 1 male; Guápiles, Costa Rica. 1 male; Port Limon, Costa Rica. [Collection of American Museum of Natural History]. 1 male; Naranjapata, Ecuador; [collection of Academy of Natural Sciences of Philadelphia].

The uncus is long and without any of the hair-like spines on the dorsal edge near the base. A weak scaphium is present. The dorsal edge of the claspers is short and nearly straight, with a sparse row of erect spines; the apex of the upper lobe is narrow, with a small cluster of spines directed outwardly, the ventral edge of the upper lobe slants downward and has a large tooth from the lower corner and another large one from the upper corner of the base. The lower lobe has short spines on the dorsal edge. There are two clusters of spines at the base of the claspers one in the upper and one in the lower corner.

Pholisora cruza new species (Fig. 10.)

Cruza very closely resembles *caribbea* and probably cannot be accurately distinguished from it by the superficial characters. The form of the male genitalia is also similar in the two species, but differs materially in detail as the accompanying figures show.

Male. Upper side brown with a scattered overscaling of yellowish. Primaries with a marginal band of blackish spots and two rather broad transverse blackish brown bands. Three small hyaline subapical spots, the middle one the smaller and slightly out of line inwardly with the other two. In one paratype there is a very tiny hyaline dot near the base of interspace 3 and another one diagonally under it in interspace 2; in the other paratype there is only the dot in interspace 3; in the type neither of the dots is present. Fringes slightly paler. Costal fold present.

Secondaries with marginal and discal blackish brown bands and the basal area similarly colored. Fringes nearly concolorous.

Beneath slightly paler than above. Primaries with inner margin narrowly much paler brown; a very narrow, threadlike, submarginal pale line. Hyaline spots repeated. Secondaries with the bands repeated.

Body above brown, head, collar, shoulder covers, tegulae and palpi brown with yellow hairs. Beneath thorax grayish brown, abdomen brown, palpi yellow and black, pectus sordid grayish. Antennae above blackish, beneath spotted with yellow.

Expanse: 22 to 24 mm.

Type material.—Holotype male; Buenavista, 75km. northwest of Santa Cruz, Bolivia (Steinbach). Paratypes: 2 males; Pozzuzo, Peru; (Martin); [collection of Academy of Natural Sciences of Philadelphia].

Pholisora corumba new species (Fig. 11.)

Corumba resembles *aurocapilla* Staudinger in having the golder scales on the anterior parts of the body. It is somewhat darker and the maculation of the wings less distinct than in *caribbea* and it lacks the overscaling of sordid yellowish in that species.

Male. Upper side. Primaries dark brown, a slightly darker marginal border, a broad dark band, slightly oblique, from the costal to the inner margin, a short, dark band, oblique, from the basal third of the costal margin and fusing with the outer band below the cell, both bands very indistinct. Three subapical spots in interspaces 6, 7, and 8, the two in interspaces 7 and 8 are larger than that in interspace 6 which is very minute. A costal fold is present. Fringes dark.

Secondaries same color as primaries with a hazy indication of the usual submarginal and discal paler bands. Fringes dark.

Beneath paler than above. Primaries with the inner margin paler than the rest of the wing, the subapical spots repeated. Secondaries with a hazy indication of a discal band, two or three yellowish scales in center of the cell and a few more forming a vertical bar at the end of the cell, a very thin overscaling of sordid yellowish scales in the abdominal fold and just above it as far as the cell.

Top of palpi, head, collar and shoulder covers blackish with golden scales. Thorax above and tegulae dark brown. Palpi beneath with a very few black hairs, slightly tinted with yellow just below the third joint, which is black with a few yellowish hairs. Pectus grayish. Antennae black above, beneath pale brownish.

Expanse: 23 mm.

Type material.—Holotype male; Corumbá, Brazil; [collection of the Academy of Natural Sciences of Philadelphia].

The male genitalia differs markedly from both *aurocapilla* and *caribbea.* The uncus is short with a few short hair-like dorsal spines near the base. No scaphium shows in the slide prepared from this specimen. The upper lobe of the claspers is slightly concave on the dorsal edge, the ventral edge is erose and is produced into a very large tooth from the lower corner of the base. A cluster of long spines projects outward from the apex of the upper lobe.

Pholisora buena new species (Fig. 12.)

Buena is somewhat like *aurocapilla* Staudinger in the golden yellow scales of the head but in the almost entire lack of contrasting maculation of the upper side of the wings, differs from that species.

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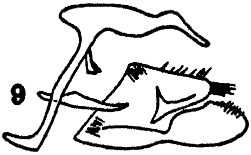

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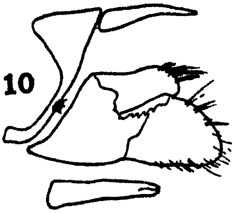

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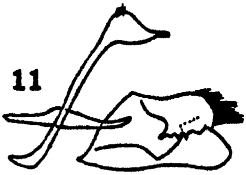

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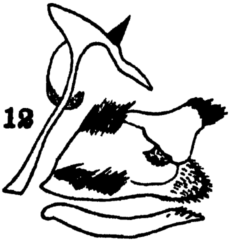

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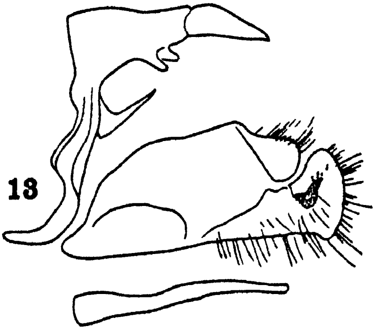

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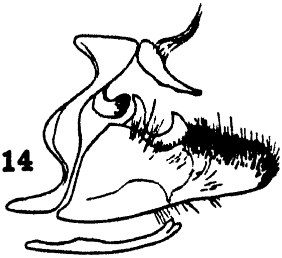

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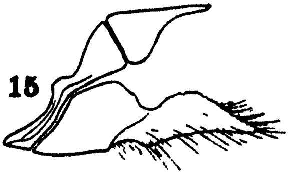

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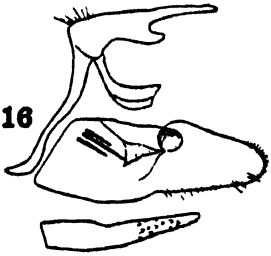

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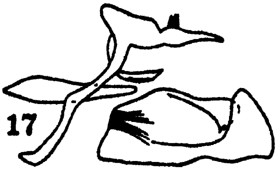

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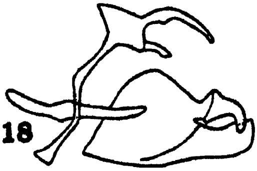

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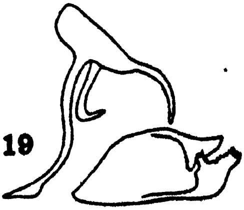

Male. Upper side brown with a slight overscaling of sordid whitish. Primaries with only the haziest suggestion of the usual dark bands. Two small subapical spots, one each in interspaces 7 and 8, that in 7 opaque and that in 8 semihyaline. Costal fold present. Fringes concolorous.

Secondaries with a hazy suggestion of submarginal and discal bands, near the abdominal fold. Fringes concolorous.

Beneath a little paler than above. Primaries a little paler in the inner and outer marginal areas; the subapical spot in interspace 8 is alone repeated.

Body above brown with a few yellow scales; head, collar and shoulder covers with golden yellow hairs, the palpi are missing but presumably they are also with golden yellow hairs. Beneath the thorax is grayish brown, the pectus sordid whitish. Antennae above blackish, beneath spotted with yellow, the club yellow.

Expanse: 24 mm.

Type material.—Holotype male; Buenavista, 75 km. northwest of Santa Cruz, Bolivia; [collection of Academy of Natural Sciences of Philadelphia].

The male genitalia have a rather feebly developed scaphium. The claspers are apically divided into two lobes, and have large patches of stiff reddish spines in the upper and lower part of the base and in the dorsal corner of the apex of the upper lobe and similar but smaller and less dense spines on the apex of the lower lobe. The aedoeagus carries a number of short, exterior spines at the apex.

Pholisora naranjapata new species (Fig. 13.)

Naranjapata resembles *giselus* Mabille but the pale submarginal band of the primaries is broader and paler and there is no costal fold on these wings in the male.

Male. Upper side dark brown. Primaries with a marginal band of elongate dark brown dashes between the veins, followed inwardly by a prominently paler brown band from the costal to the inner margin, the rest of the area to the base very dark brown, with a hazy indication of two blackish brown bands, one around the end of the cell and the other across it. Three small, hyaline subapical spots in an oblique line in interspaces 6, 7, and 8, which may be reduced in number or lacking in occasional individuals. A light overscaling of yellowish. Fringes concolorous. No costal fold in the male.

Secondaries similar to the primaries but the submarginal pale band is narrower and less prominent. Fringes concolorous.

Beneath. Paler than above and with similar markings. Subapical spots of the primaries repeated. A light overscaling of yellowish.

Body above dark brown, head, collar, shoulder covers and palpi with some yellow hairs. Beneath the thorax is brown with yellow hairs, abdomen brown, palpi grayish brown, pectus brown and yellow. Antennae above blackish, beneath brown, the club paler.

Female. Paler than the male, all the markings more distinct, both wings overscaled with yellow on both sides somewhat heavier than in the male. On the upper side of the primaries of one paratype there are two small dots, one hyaline in the basal third of interspace 3 and the other, very minute and opaque, diagonally below in interspace 2, of these only the spot in interspace 3 is repeated on the under side of the wings.

Expanse: male 28 to 29 mm.; female 30 to 32 mm.

Type material.—Holotype male; Dos Puentes, Ecuador; 1,750 feet; (W. J. Coxey). Allotype female; Naranjapata, Ecuador; 1,850 feet; (W. J. Coxey). Paratypes: 14 males and 3 females, Naranjapata; 4 males and 1 female, Dos Puentes; 3 males, Huigra; 1 male, Bucay, (975 feet); 1 male, Hacienda Cutugauy, Ventura (1,600 feet); all Ecuador; (all W. J. Coxey); [collection of Academy of Natural Sciences of Philadelphia].

The claspers terminate in a broad, slightly rounded apex, back of which is a dorsal suture, on the side of the apical part there is an irregular tooth carrying smaller teeth. The uncus is rather short and broad at the base.

Pholisora huigra new species (Fig. 14.)

Huigra resembles the previously described *naranjapata* but is smaller and the male has a costal fold on the primaries, which *naranjapata* lacks and the pale submarginal band of the primaries is much narrower in *huigra.*

Male. Upper side dark brown. Primaries with a narrow, blackish marginal band followed inwardly by a narrow pale band, the rest of the wings blackish brown to the base with a small slightly paler area at the end of the cell. A light overscaling of sordid yellowish. Three small subapical spots in interspaces 6, 7 and 8, which may be reduced to one or two or absent and all of these spots or some of them may be hyaline or none of them hyaline but merely slightly paler opaque spots. Fringes concolorous. Costal fold present.

Secondaries similar, with hazy indications of marginal and discal bands. A light overscaling of sordid yellowish, which may be absent from both wings in worn specimens. Fringes concolorous.

Beneath paler than above, a narrow, somewhat macular, pale submarginal band on both wings, this band as well as the other maculation is very indistinct in some individuals. Subapical spots repeated.

Body above blackish brown; head, collar, shoulder covers and palpi with yellow hairs. Beneath thorax grayish brown, abdomen brown, palpi yellow and black, pectus grayish brown. Antennae above blackish, beneath spoted with yellow, the club yellow.

Expanse: 23 to 26 mm.

Type material.—Holotype male, Cuenca Trail above Huigra, Ecuador, 4,500 feet, (Coxey). Paratypes: 14 males; 2, Cuenca Trail; 2, Dos Puentes, Ecuador, 1,750 feet, (Coxey); 5, Naranjapata, Ecuador, 1,850 feet, (Coxey); 5, Huigra, Ecuador, 4,000 feet, (Coxey), (Rhoades); [all in collection of the Academy of Natural Sciences of Philadelphia].

Occasional individuals are not so obscurely marked as the majority of them are and in these the primaries show more plainly two darker transverse bands, one around the end of the cell and the other across it and on the secondaries the bands are also more evident. In one individual from Naranjapata there are two very tiny hyaline spots on the primaries, one near the base of interspace 3 and the other diagonally below it in interspace 2 and these are repeated on the under side of the wings. As the form of the male genitalia is identically the same in these specimens as that of the darker, more obscure specimens they are apparently merely variants.

In the male genitalia there is a scaphium. The claspers are not apically divided but terminate in a broad, rounded apex; rising from the basal half of the dorsal edge are two large teeth, projecting slightly backward and separated by a deep excavation; a dense mass of fulvous spines, some short and some longer, directed upward, cover a large part of the apical half of the claspers and extend along the dorsal edge to the innermost of the two large teeth.

Pholisora madrea new species (Fig. 15.)

In superficial appearance *madrea* is somewhat like *mazans* Reakirt but is slightly smaller and the type on the upper side lacks the spot in interspace 7 of the subapical series of the primaries, which is usually present in *mazans*. The excavation between veins 4 and 6 in the outer margin of the secondaries is very feeble, much less developed than in *mazans*.

Male. Upper side dark brown. Primaries with a blackish marginal band; a narrow blackish band from the costal to the inner margin, passing around the end of the cell; another similar band across the cell and fusing with the previous band below the cell; all these bands are more or less indistinct. Two very small hyaline subapical spots, one each in interspaces 6 and 8; a small hyaline spot in the basal quarter of interspace 3. Costal fold present. A slight overscaling of yellow in the apical area. Fringes concolorous.

Secondaries with three narrow, rather macular, blackish bands, one marginal, one discal and one subbasal, all rather indistinct. A slight overscaling of yellow, especially in the outer marginal quarter and abdominal fold. Fringes concolorous.

Beneath paler than above. Primaries with the dark bands indistinctly repeated; the hyaline spots repeated and another subapical spot in interspace 7 barely discernible. Apex slightly overscaled with pale yellow. Secondaries with the dark bands and yellow overscaling of the upper side and some yellow scales at the end of the cell.

Head, palpi and body above brown with some yellow hairs. Palpi and pectus beneath blackish brown with yellow hairs; thorax brown with sordid yellowish hairs; antennae dark brown on both sides, the club beneath paler.

Expanse: 24 mm.

Type material.—Holotype male; Madre de Dios, Peru; [collection of Academy of Natural Sciences of Philadelphia].

In the male genitalia the claspers are not apically divided but taper to a point, with numerous small serrations, especially on the dorsal edge.

Pholisora cartagoa new species (Fig. 16.)

Cartagoa is somewhat similar to some individuals of *inconstans* Bell but the form of the male genitalia readily separates the two species.

Male. Upper side brown. Primaries with two slightly darker brown bands from costal to inner margin, one passing outside the end of the cell and the other across it, the first band is wide at the costal margin and tapers to the inner margin. Fringes concolorous. Costal fold present.

Secondaries with two similar bands, one discal and the other subbasal. Fringes concolorous.

Beneath. Both wings paler than above, the bands barely discernible.

Body above brown, head and palpi with some sordid yellowish hairs. Beneath the body is grayish brown, the palpi white with a few dark hairs, the pectus sordid whitish. Antennae above blackish, beneath a little paler with small yellow dots at the joints on the side, the club pale brown.

Expanse: 28 mm.

Type material.—Holotype male and one male paratype; Cartage, Costa Rice, (Ethel Gillott), 4,500 feet; [collection of Academy of Natural Sciences of Philadelphia].

A well developed scaphium is present in the male genitalia. The claspers taper to a broad, rounded apex, the apical half of the claspers is dorsally divided from the basal half and at this point is a roundish area covered with small teeth, back of this there is a large discal tooth projecting downward; there are some stout spines projecting forward from the base. The aedoeagus carries some small external teeth.

Pholisora iguala new species (Fig. 17.)

Iguala resembles *cartagoa* but is a little paler in ground color, has no costal fold on the primaries of the male, and the male genitalia are different in detail.

Male. Upper side brown, with a few scattered, sordid yellowish scales. Primaries with two whitish subapical spots in interspaces 7 and 8, which may be absent; a narrow, slightly darker marginal band; a broad dark band from the costal margin, a little before the apex, to the inner margin and another broad discal band across the cell to the inner margin. Fringes concolorous. No costal fold.

Secondaries with three dark bands, one narrow submarginal, one discal and one subbasal. Fringes concolorous.

Beneath a little paler than above. On the primaries the subapical spot in interspace 8 is repeated when present above and sometimes the spot in interspace 7; the dark bands of the upper side are absent or only dimly visible, there is a hazy submarginal band of small pale spots and some sordid pale yellowish scales in the submarginal area and sometimes a few at the base of the costal margin.

Secondaries with the dark bands faintly repeated, an overscaling or sordid yellowish quite heavy in and just above the abdominal fold and growing less upward to the costal margin, these scales form a narrow bar at the end of the cell.

Body above dark brown with some fulvous hairs, head and palpi blackish brown with yellow hairs. Beneath the body is grayish, the palpi and pectus grayish white, except in the Colima paratype where they are a pale tan brown. Antennae blackish above, beneath spotted with yellow, the club and for a little below it yellow.

Expanse: 26 mm. to 29 mm.

Type material.—Holotype male; Iguala, Mexico; 2 male paratypes: Iguala, Mexico; Chilpancingo, Mexico; [collection of the

American Museum of Natural History]. One male paratype; Colima, Mexico; [collection of Academy of Natural Sciences of Philadelphia].

The male genitalia have a developed scaphium. The claspers terminate in a broad apex, back of which the dorsal edge is produced inwardly into a somewhat triangular flange with two teeth at the apex. There is a heavy cluster of stout spines at the base of the claspers. The genitalia of the Colima paratype with the tan colored palpi are the same as in the other specimens.

Pholisora (?) **astra** new species (Fig. 18.)

In color and form of maculation, except the color of the spots of the primaries, *astra* resembles several of these small species of *Pholisora*, the dark bands of the wings are somewhat more in contrast with the light areas than in *aurocapilla, caribbea* and *corumba*. The blue spots of the primaries are not possessed by any of the other species of *Pholisora* with which the writers are familiar.

Male. Upper side. Primaries brown, the costal, outer and inner margins blackish, a narrow, oblique blackish band from the costal margin to vein 1, passing outside of the cell, a broader blackish band crossing the cell from the center to the base and extending to vein 2. Three subapical spots in interspaces 6, 7 and 8, a slightly larger spot in interspace 3 a little inwardly of the center, another similar one obliquely inward below it in interspace 2 and another minute one in the end of the cell, all of these spots are formed by an accumulation of bright blue scales. There is a thin overscaling of pale scales, sordid yellowish at the base, shading to sordid whitish at the outer margin of the wings. No costal fold. Fringes blackish.

Secondaries same color as primaries, inner margin blackish, the outer margin with blackish spots between the veins, an irregular, blackish discal band and a short blackish sub-basal band. Overscaling of sordid scales as on the primaries. Fringes blackish.

Beneath much paler. Primaries with slightly darker marginal spots between the veins, the inner margin narrowly paler, widening toward the base. The spots of the upper side do not appear on the under side. Secondaries as above but much paler.

Top of head, palpi, collar and shoulder covers blackish with some yellow hairs. Thorax above blackish with yellow brown hairs at the base. Tegulae missing. Abdomen blackish with yellow brown hairs at the base. Thorax and abdomen beneath brown. Palpi beneath yellow and black. Pectus grayish. Antennae above black, beneath pale brown.

Expanse: 24 mm.

Type material.—Holotype male; Achinamiza, Peru; [collection of Academy of Natural Sciences of Philadelphia].

The uncus is rather long, thin and curved. The upper lobe of the claspers is concave on the dorsal edge and at the apex is curved downward, overlapping the lower lobe.

Heliopetes macaroides new species (Fig. 19.)

On the upper side *macaroides* resembles *macaira* form *nivella* Mabille but on the under side is more heavily marked, as in *macaira,* but differs from *macaira* in having the submarginal band of the secondaries deeply indented on vein 5 and ending below on vein 2, neither of which is the case in *macaira.*

Male. Upper side. Both wings white. On the primaries the costal margin is edged with brown as far as the end of the costal fold. The veins are black along the outer margin and at the apex, a thin overscaling of blackish brown between the veins along the outer margin and at the apex. Base of the wings very narrowly black, especially below vein 1. Fringes alternately brown and white.

Secondaries. An elongate thinly scaled brownish spot between veins 7 and 8 near the base of the interspace, a minute brown dot on the outer margin at the end of each of veins 1 to 6. The marginal band and the spot below the cell of the under side of these wings show dimly through on the upper side. Fringes white with a brown spot at the end of veins 2, 3 and 4.

Underside. Primaries as above, the costal fold area black and some pale brownish scales. Secondaries with a spot of thin brown overscaling near the base above vein 8 and another one near the center, a darker brown spot between veins 7 and 8 corresponding to the one on the upper side of the wings, a suffusion of brown scales in the upper half of the cell and across the base of interspaces between veins 2 and 7, between veins 1 and 2 the interspaces is entirely overscaled with brown, the abdominal fold is white except at the base and the inner margin. A broad marginal band of brown beginning rather narrowly on vein 2 the inner edge is produced sharply inward to vein 4 where it curves outward again to vein 5 and from here slants sharply inward to vein 7 extending above that vein a little more than half the interspace. The marginal band is thus very irregular on the inner edge. The fringes beneath are not so purely white as above but are sordid brownish with darker spots at the end of veins 2 to 6.

The palpi and antennae are missing. Top of head, collar and shoulder covers are brownish, abdomen with white hairs. Beneath pectus and base of palpi white, thorax grayish, abdomen white.

Expanse: 31 mm.

Type material.—Holotype male; Buenavista, Bolivia; [collection of American Museum of Natural History].

The form of the genitalia differs materially from that of *macaira,* the uncus being longer and thinner and the termination of both lobes of the claspers differently shaped.

STUDIES IN THE SCARABAEIDAE. II[1]

(COLEOPTERA)

BY MARK ROBINSON
Sharon Hill, Pennsylvania

(Plate IV)

Included in the present paper are some studies I have made during the course of the past few years on the genus *Trox*. This work was originally intended to be a revision but unfortunately I have been unable to decide whether some of our forms are extremely variable or composed of numerous, closely related species, only more specimens and time will enable me to unravel this complexity. A character which has not heretofore been brought out in separating the sub-genera *Omorgus* and *Trox* is the position of the second segment of the antennae where it joins the scape, in *Trox* it is attached to the apex while in *Omorgus* it is below the apex.

Loomis was the first author in this country to make use of the male genitalia as a further check on the validity of the species of *Trox*. This excellent character can be augmented in the larger species by the size of the wings to separate closely related forms. Contrary to general belief some of our species exhibit good sexual characters such as anterior tibial spurs and in the case of one species the posterior tibiae is greatly flattened in the male.

This study is based on over two thousand specimens; forty-two species are discussed of which twenty are discussed as new. The types are in the author's collection now on deposit at the Academy of Natural Sciences Philadelphia, unless otherwise designated. My appreciation and gratitude are expressed to the following persons and institutions who have loaned me material or otherwise assisted in the preparation of this paper: Mr. E. T. Cresson, Jr. and the Academy of Natural Sciences of Philadelphia; Dr. Nathan Banks and the Museum of Comparative Zoology; L. J. Bottimer; O. L. Cartwright; R. C. Casselberry; E. A. Chapin; M. A. Cazier; C. A. Frost; L. W. Saylor; J. W. H. Rehn; V. S. L. Pate; M. W. Sanderson; and especially to R. J. Sim for much helpful advice and material aid.

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[1] Trans. Amer. Ent. Soc. LXIV, p. 107-115, 1938.

Onthophagus subopacus new species

1914. *Onthophagus lecontei* Schaeffer (not Harold), Journ. N. Y. Ent. Soc. XXII, p. 298.

Lack of a frontal carina distinguishes this species from *lecontei* Harold. I have in my collection specimens from La Venda de Apio, Mexico, determined by Arrow as typical *lecontei* and beside the frontal carina there are other smaller differences such as apex of pygidium alutaceous in *lecontei* and the clypeus in the female is much more reflexed.

Ovate, opaque, black; legs reddish; body covered with short fulvous hairs.

♂. Clypeus reflexed at right angles to the head, emarginate; angles on each side rounded; shining, with a few coarse punctures scattered over the surface. Head alutaceous with some coarse punctures on the vertex. There is no trace of a frontal carina and just a vague indication of a curved carina basally.

Pronotum convex, alutaceous, rather coarsely punctured; each puncture has a small granule overhanging it and is hair bearing. The base has a fine marginal line. There is a lobe at the center of the pronotum; this lobe is emarginate, rounded on each side and slightly reflexed anteriorly.

Elytral striae nearly equidistant, shining, crenately punctured. Intervals alutaceous, biseriately punctured; each puncture is hair bearing with a small granule overhanging. Pygidium coarsely punctured, alutaceous basally, shining toward the apex.

Anterior tibiae long, slender, arcuate, quadridentate, crenate above and between the teeth, the apex with a pencil of yellowish hairs.

♀. Clypeus shining, reflexed, triangularly emarginate; angles rounded; surface coarsely and densely punctured, some of the punctures are transversely confluent. Frontal carina long, well indicated; basal carina a little shorter but higher. Surface on the vertex alutaceous with a few scattered medium punctures.

Sculpturing of pronotum same as male except that the lobe is represented by a short, oblique line on each side of the middle.

Elytral striae and intervals the same as male. Pygidium a little more shining than male.

Anterior tibiae short, not very slender, nearly straight, quadridentate, crenate above and between the teeth. Apex without a pencil of hair.

Length, 4.65 to 5.7 mm.; breadth, 2.86 to 3.3 mm.

Type.— ♂ ; Prescott, Yavapai County, Arizona.

Allotype.— ♀ ; Prescott, Arizona.

Paratype.—1 ♀ ; Prescott, Arizona.

Aphodius aculeatus new species

This species is allied to *acerbus* Horn, from which it differs, among other things, in having the clypeus rougher, the head trituberculate and the elytral striae more coarsely punctured.

Oblong-oval, convex, shining, testaceous; the head and pronotum a little darker. Head, thorax and anterior half of elytra fimbriate.

Clypeus broadly but not deeply emarginate, angles on each side armed with a small denticle, sides arcuate; genae not prominent, obtuse. Clypeus with a transverse varina; head trituberculate. Frons and clypeus coarsely punctured and wrinkled.

Thorax very convex, sides arcuate, hind angles obtuse. Basal marginal line entire. Surface of pronotum covered with large and small punctures intermixed, at no point would they be called dense.

Elytra about equal in width at base to pronotum; humeri obtuse. Striae quite deeply cut, rather coarsely crenately punctured. Intervals slightly convex with a few scattered fine punctures.

Mesosternum with a fine carina between the coxae. Metasternum with fine and large punctures intermixed. Abdomen very finely punctured, the punctures each bearing a fine yellow hair.

Anterior tibiae tridentate, crenate above third tooth; anterior face impunctate. First joint of tarsi shorter than second; spur acute, down curved at tip. Short spur of middle tibiae three-fourths as long as long spur, acute. Hind femura with a few fine punctures scattered over the surface. First joint of posterior tarsi not quite as long as next two joints together. Apex of posterior tibiae fimbriate with long nearly even spinules.

Length, 3.75 mm.; breadth, 2 mm.

Type.—Sex ?; Richfield, Sevier County, Utah; August 15, 1929; (light trap).

Aphodius (Platyderides) excavatus new species

Aphodius excavatus is one of the smaller species in the subgenus *Platyderides* allied to *ochreipennis* Horn but lacks the oblique sinuation of the base of the thorax and is much smaller in size.

Moderately elongate, shining; head, thorax and elytral suture reddish; elytra and legs yellowish-brown.

Clypeus emarginate, sides straight; angles broadly rounded; genae not very prominent. Head not tuberculate, finely punctured; the punctures are slightly coarser near the eyes; the fine punctures are separated by about four times their diameter.

Thorax moderately convex, more than twice as wide as long; sides arcuate; hind angles obtuse but well defined. There is a rather well defined impression near the hind angles; this depression is very densely, moderately punctured. Disk evenly, finely punctured with coarse punctures intermixed laterally and posteriorly.

Elytra not quite as wide as thorax; humeri rounded. Striae finely impressed, crenately punctured. Intervals flat, triseriately, finely punctured. Apex and lateral margins of elytra with an alutaceous sculpturing.

Mesosternum not carinate between the coxal plates. Metasternum with a few fine, scattered punctures. Abdomen finely punctured.

Anterior tibiae with three or four slight crenulations above the third tooth; spur slender, acute, shorter than first two tarsal joints. Short spur of middle tibiae one-half the length of the long spur, acute. Spinules of middle and posterior tibiae long and unequal in length.

Length, 4.9 mm.; breadth, 2.4 mm.

Type.—Sex ?; Utah.

Aphodius (Platyderides) magnificens new species

1928. *Aphodius haldemani* Brown (not Horn), Can. Ent. LX, p. 39.

I believe this species to be distinct from *haldemani* Horn because of its different color, coarse punctures on the pronotum denser, male anterior tibial spur is truncate and not oblique and the short spur of the middle tibiae is prolonged inward and not rounded.

Oblong, moderately convex; elytra, sides of pronotum, clypeus and femora reddish; disk of pronotum, head, tibiae and sternum darker red, shining.

Clypeus shallowly, broadly emarginate; angles broadly rounded and slightly reflexed; sides straight; genae moderately prominent, fimbriate. Head unarmed, finely and sparsely punctured.

Thorax transverse; sides slightly converging in front, explanate; hind angles broadly rounded. Near the hind angles there is a broad, shallow depression. Sides of pronotum and area extending up on rear of disk of pronotum with large coarse punctures; entire pronotum sparsely and very finely punctured, the fine punctures are smaller in diameter than those on the head. Basal marginal line obsolete.

Elytra at base narrower than thorax; humeri obtuse. Striae fine, crenately punctured. Intervals barely convex, very finely punctured.

Mesosternum not carinate. Metasternum alutaceus. Abdomen rather coarsely punctured. Anterior tibiae tridentate, smooth in front and above third tooth. First joint of tarsi shorter than the second. Posterior tibiae fimbriate at apex with long uneven spinules; first joint of tarsi as long as next three together.

♂. Spur of anterior tibiae long triangular, truncate at tip. Short spur of middle tibiae nearly half as long as long spur, truncate at tip with the inner angle produced inwards. The inner half of the middle and posterior femora and trochanter densely and coarsely punctured on posterior edge; these punctures bear a long yellow hair.

♀. Spur of anterior tibiae acute, strongly incurved at tip. Short spur of middle tibiae two-thirds as long as longer spur, acute.

Length, 7.9 to 9.25 mm.; breadth, 3.8 to 4.6 mm.

Type.—♂ ; Payne County, Oklahoma; October 31, 1926; (W. J. Brown).

Allotype.—♀ ; Same data as type. [Canadian National Collection.]

Paratypes.—2 ♂ ; same data as type. 1 ♀ ; Payne County, Oklahoma; November 10, 1925; (W. J. Brown); [Canadian National Collection].

Aphodius (Platyderides) transversus new species

The finely, evenly punctured pronotum will serve to distinguish this species from any other in the subgenus *Platyderides.*

Oblong, moderately convex and elongate, parallel. Head and thorax piceous; genae, sides of thorax and elytra, dark reddish-brown. Ventral side reddish-brown with the hind femura and abdomen yellowish-brown.

Head seven-tenths as wide as thorax with no trace of tubercules or carina; finely and moderately punctured; the punctures are separated by from one times their diameter near the sides to four or five times near the center; impunctate in front of the eyes. Clypeus is barely immarginate and very obtusely angulate with the entire edge reflexed. Genae prominent with the fimbria slightly longer than around the clypeus.

Thorax feebly convex, strongly transverse, two-thirds as long as wide, alutaceous. Sides slightly explanate, gradually convergent from hind angles which are very obtuse. Pronotum evenly and moderately punctured; the punctures fine and but very little closer laterally. Basal marginal line obsolete.

Elytra at base slightly narrower than thorax; humeri obtuse. Striae fine, very finely punctured. Intervals slightly convex, biseriately punctured; surface covered with an alutaceous sculpturing.

Mesosternum not carinate. Metasternum concave in front of the posterior coxal plates, microscopically alutaceous. Abdomen with a few hair-bearing punctures, alutaceous.

Anterior tibiae tridentate, slightly crenate above upper tooth, impunctate on anterior face. First joint of anterior tarsi shorter than the second. Short spur of middle tibiae two-thirds as long as long spur, acute. First joint of posterior tarsi longer than the two following. Apex of intermediate and posterior tibiae fimbriate with long uneven hair.

Length, 6.6 mm.; breadth, 2.9 mm.

Type.—Sex ?; Palmerlee, Cochise County, Arizona; July.

Aphodius comanchi new species

The position of the anterior tarsi, the shape of the clypeus and the short middle tibial spur will distinguish this species from others in Horn's group I-C.[2]

Oblong, convex, shining; anterior tibiae and elytra reddish-brown; head and pronotum darker; legs and abdomen brownish-yellow. Head, thorax and anterior half of elytra fimbriate.

Clypeus broadly but not deeply emarginate at middle; the angles on each side prominent, acute and reflexed. Genae not prominent, obtuse. Head rather coarsely and densely punctured; punctures a little smaller medially; tubercules obsolete.

Sides of thorax slightly converging in front; hind angles well defined, obtuse. Basal marginal line well marked. Punctures coarse and fine intermixed densely, slightly less so on the disk.

Elytra not quite as wide as thorax at base; humeri not dentate. Striae well defined, crenulately punctured; intervals convex, biseriately punctured, alutaceous at apex.

Mesosternum not carinate between the coxae. Metasternum coarsely punctured. Abdomen moderately densely punctured; the punctures not very coarse but each bears a yellow hair.

Anterior tibiae impunctate in front, tridentate, crenate above third tooth. Tarsi and spur joined to tibiae opposite third tooth; second joint longer than third and fourth together; spur long, acute and down curved. Short spur of middle tibiae barely rising above apex of tibiae, truncate, with the inner angle produced. Hind edge of posterior femur fimbriate with long yellow hair. First joint of posterior tarsi as long as next three together. Apex of hind tibiae with long uneven spinules.

Length, 6.4 mm.; breadth, 2.85 mm.

Type.—Sex ?; Comanche, Comanche County, Texas.

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[2] Trans. Amer. Ent. Soc. XIV, pp. 1-110, 1887.

Aphodius inermis new species

Among other things the very convex form and the shorter first joint of the posterior tarsi will distinguish this species from *alternatus* Horn.

Ovate, very convex, shining, black; legs reddish-brown, underneath reddish; anterior angles of thorax lighter in color.

Clypeus very slightly emarginate; angles broadly rounded; sides straight, genae obtuse, not very prominent. Head moderately punctured, obsolete medially.

Thorax two-thirds as long as wide, convex, slightly fimbriate. Sides parallel in basal half, gradually converging in front. Hind angles distinct, obtuse. Punctures on side of pronotum separated by about their own diameters, gradually sparser on the disk, there is little difference in the size of the punctures. Basal marginal line distinct.

Elytra at base narrower than thorax; humeri obtuse. Striae crenately, coarsely punctured; intervals barely convex, biseriately punctured. The punctures on the head, pronotum, elytral intervals and metasternum are all approximately the same diameter.

Mesosternum not carinate. Metasternum with a few scattered punctures medially. Abdomen sparsely punctured with hair bearing pits.

Anterior tibiae tridentate, crenate above third tooth. First tarsal joint smaller than second. Middle tibial short spur half as long as long spur. First joint of posterior tarsi slightly longer than next two together. Apex of hind tibiae fringed with short even hair.

Length, 3.7 mm.; breadth, 1.76 mm.

Type.—Sex ?; Utah.

Aphodius saylorea new species

This species keys to *stercorosus* in Brown's key to Horn's group I-B2^2 from which it differs in color, pronotum and elytral sculpturing and length of hind tarsi. I take pleasure in naming this species after my good friend Lawrence W. Saylor.

Oblong, parallel, convex, black, shining; anterior angles of thorax lighter; legs rufo-testaceous.

Clypeus slightly emarginate; angles rounded, sides straight; genae obtuse, not prominent. Head finely but quite closely punctured; the punctures separated by about their own diameters except basally where they are more distant. Head not tuberculate.

Thoracic sides arcuate, converging in front. Disk very convex, finely sparsely punctured; the punctures gradually get denser and larger laterally where they are separated by their own diameter. Basal marginal line obsolete.

Elytra a little wider than thorax; humeri prominent but obtuse. Striae well marked, crenately punctured. Intervals a little convex, moderately, biseriately punctured. Alutaceous sculpturing better developed than on head or pronotum.

Mesosternum with a fine carina between the coxal plates. Metasternum finely and sparsely punctured. Abdomen with a few scattered fine punctures.

Anterior tibiae tridentate, Crenate above third tooth; anterior face punctured. First tarsal joint longer than second. Short spur of middle tibiae over half the length of long spur. Posterior tibiae fringed with long uneven spinulae at apex. First joint of posterior tarsi equal in length to next three together. Length, 3.25 mm.; breadth, 1.5 mm.

Type.—Sex ?; Patagonia, Santa Clara County, Arizona; July, 1936; (E. S. Ross); [L. W. Saylor's collection].

Paratype.—1 specimen with the same data as type; [Author's collection].

Aphodius serval pennsylvanicus new subspecies

1930. *Aphodius serval* Sim (not Say, 1837), Journ. N.Y. Ent. Soc., XXXVIII, p. 143.

This species was recorded by Sim as *serval* Say but there are so many differences between the true *serval* and *pennsylvanicus* that it should be recognized as a good subspecies and perhaps further study will elevate it to specific rank. In true *serval* the clypeus is denticulate, the thorax more convex, the striae more coarsely punctured and the intervals are distinctly more convex.

Elongate, parallel, piceous; clypeus, legs and anterior angles of pronotum reddish; elytra yellowish with black maculations, the same as *serval.*

Clypeus emarginate at middle, sides arcuate, angles distinct but not denticulate; genae fairly prominent. Head moderately deeply punctured; the punctures are separated from one times their diameter near the edge to three or four times their width at the center. Head faintly trituberculate.

Pronotum five-ninths as long as it is wide; disk moderately convex; sides parallel, arcuate anteriorly; hind angles distinct. Small punctures evenly and moderately placed over entire disk, coarse punctures dense near the sides, sparsely placed posteriorly.

Elytra parallel, distinctly narrower at base than the thorax; humeri distinct, barely dentiform. Striae finely indicated, finely and sparsely punctured. Intervals flat with a few minute punctures and elutaceous sculpturing.

Mesosternum opaque at middle, not carinate. Anterior tibiae tridentate, crenate above third tooth.

♂. Anterior tibial spur long, curved inwards at tip, not acute. Short spur of middle tibiae less than one half as long as long spur.

♀. Anterior tibial spur shorter, slender and acute. Short spur of middle tibiae slender, over one half the length of long spur.

Length, 4.4 to 4.7 mm.; breadth, 2 to 2.2 mm.

Type.—♂; Chestnut Hill, Pennsylvania; March 13, 1938; (E. Endy).

Allotype.—♀; same data as type.

Paratype.—3♂; same data as type. 3♂; Riverton, New Jersey; March 25, 1928; (R. J. & M. B. Sim). 2♀; Riverton, New Jersey; March 13, 1929; (R. J. & M. B. Sim).

Ataenius convexus new species

The fine punctures on the head, the virtually impunctate area anterio-medially on the pronotum and the more convex elytral interstices will serve to distinguish this species from *desertus* Horn it's nearest ally.

Oblong — oval, convex, reddish-brown; shining. Genae, thorax and elytral edge fimbriate.

Clypeus rather deeply triangularly emarginate; angles on each side nearly angulate, sides arcuate; genae not very prominent, obtuse. Clypeus impressed behind the emargination. Head very finely, evenly and sparsely punctured.

Thorax convex, two-thirds as long as wide, slightly narrower posteriorly; sides feebly arcuate, hind angles obtuse. The disk is coarsely, moderately punctured laterally and posteriorly, with very fine punctures covering the entire surface. Basal marginal line entire.

Elytra not quite as wide as thorax; humeri denticulate. Striae impunctate, intervals very convex, coarsely punctured on the sides especially the inner side, a few fine punctures scattered on top.

Mesosternum carinate between the coxae. Metasternum with a few scattered fine punctures. Abdomen with a few coarse punctures near the sides. Anterior tibiae tridentate, not crenate. Posterior femora with a short marginal line near the knee. Posterior tibiae with an accessory spinule.

Length, 3.25 mm.; breadth, 1.55 mm.

Type.—Sex ?; Hidalgo, Hidalgo County, Texas, August.

Paratypes.—1 specimen; Hidalgo, Texas, August. 1 specimen; Texas.

Trox (Omorgus) texanus Leconte

1854. *Trox texanus* Leconte, Proc. Acad. Nat. Sci., VII, p. 214.

I have dissected the three specimens in the type series of this species and find they are all females. Notwithstanding this I think *texanus* is a good species and should be so placed on our lists. This is the largest species found in this country and is distinguished by its elongate tubercules on the elytra alternating with rows of rather deep punctures. Some of the tubercules are confluent laterally, the larger ones are tomentose posteriorly, especially near the sides of the elytra. I wish to designate the specimen with the name label on it as the lectotype of this species.

Length, 19 mm.; breadth, 12 mm.

Trox (Omorgus) suturalis Leconte

1854. *Trox suturalis* Leconte, Proc. Acad. Nat. Sci., VII, p. 214.

There are two specimens of this species in the Leconte collection, the first is a male and the second a female. I have dissected the male and find *suturalis* is also a good species. I wish to take this opportunity to designate the male as the lectotype of this species. The tubercules on this species are extremely convex and alternate to a marked degree. On the dorsal part of the elytra some of the larger tubercules are tomentose posteriorly, this tomentosity gradually increases laterally until along the sides the tubercules are all covered with this short flattened hair.

Length, 15 mm.; breadth, 10 mm.

Trox (Omorgus) umbonatus Leconte

1854. *Trox umbonatus* Leconte, Proc. Acad. Nat. Sci., VII, p. 214.
1922. *Trox platycyphus* Loomis, Journ. Wash. Ac. Sci., XII, p. 133.

I have compared a specimen in my collection with *umbonatus* and *platycyphus* and find they are identical in all respects. The specimen in the Leconte collection with the name label on it is hereby designated the lectotype of *umbonatus*.

Trox (Omorgus) tesselatus Leconte

1854. *Trox tesselatus* Leconte, Proc. Acad. Nat. Sci., VII, p. 216.

Trox tesselatus is represented in the Leconte collection by three specimens, the first two are females, the third is a male and is hereby designated the lectotype. This species differs from *integer* Lec. and *suturalis* Lec., its nearest relatives, by the alternate rows of tubercules being more nearly equal in size and male genitalic characters. A good series of *tesselatus* was collected at Altar Valley, Arizona, August 2, 1925 by L. J. Bottimer (on a dead hawk) and there is very little variation in any of his specimens.

Trox (Omorgus) integer Leconte

1854. *Trox integer* Leconte, Proc. Acad. Nat. Sci., VII, p. 216.
1922. *Trox oligonus* Loomis, Journ. Wash. Ac. Sci., XII, p. 133.

The group to which these species belong are very close in relationship and further study with more specimens may show these to be the same species. I think it best to let them stand as distinct species for the present. The specimen in the Leconte collection with the name label on it is hereby designated the lectotype of *integer.*

Trox (Omorgus) gemmulatus Horn

1874. *Trox gemmulatus* Horn, Trans. Am. Ent. Soc., v, p. 8.

I herewith to designate the specimen with the type label on it in the Horn collection as the lectotype of this species. There are four paratypes in the series from San Diego, California.

Trox (Trox) variolatus Melsheimer

1846. *Trox variolatus* Melsheimer, Proc. Acad. Nat. Sci., Phila., II, p. 138.
1854. *Trox erinaceus* Leconte, Proc. Acad. Nat. Sci., VII, p. 212.

The specimen with the name label on it in the Melsheimer collection agrees very well with his description of *Trox variolatus.* He writes " Elytra with alternate rows of oblong tufts of short, scaly, fuerruginous or black hairs." This is a very rare character in this species but his specimen has two shades of hair on the elytra. I have compared this specimen with Leconte's type of *erinaceus* and find they are the same species. I would like to designate the specimen in the Melsheimer collection with the name label on it the type of *variolatus* and the specimen with the name label on it in the Leconte collection the lectoype of *erinaceus.*

Trox (Trox) foveicollis Harold (Pl. IV, fig. 1 and 2.)

1872. *Trox foveicollis* Harold, Col. Hefte, IX, p. 181.
1864. *Trox insularis* Chevrolat, Ann. Soc. Ent. France, IV, p. 416.

The species we formerly knew as *insularis* must be known as *foveicollis*. I have not been able to find the type of *insularis* in the Poey collection but all the Cuban specimens agreeing with the description of *insularis* which I have seen, are different specifically from any of our species. The type of *foveicollis* was compared by Boucomont and Van Emden with specimens sent by Sim, for which comparisons I extend my thanks.

Trox (Trox) terrestris Say (Pl. IV, fig. 6.)

1825. *Trox terrestris* Say, Journ. Ac. Nat. Sci. Phila., III, p. 192.

It is nearly impossible to distinguish this species from *foveicollis* externally, but usually the thoracic pits are shallower and the setae on the elytral tubercules are darker in color.

Trox (Omorgus) nodosus new species (Pl. IV, fig. 12.)

This species superficially resembles *scutellaris* Say more than any of the other species in the subgenus *Omorgus* but the notch at the hind angles of the thorax is deeper, *scutellaris* does not have tomentose spots on the elytral tubercules and the tubercules are more or less flattened on top. The gentalia of *nodosus* resembles *texanus* Lec. but this species has smaller wings (length, 10 mm., breadth, 3.5 mm.) and the elytral tubercules are more or less elongate.

Broadly ovate, black, shining when clean.

Clypeus triangular, strongly reflexed. Head with two tubercules, punctures not very close.

Pronotum with the usual form in the *scutellaris* group. Elytral tubercules large, not flattened, transversely confluent, slightly alternating in size. Most of the tubercules have a small tomentose spot posteriorly.

Anterior tibiae with one or two teeth above the apical bifid procees.

Wings: Length, 14 mm., breadth, 4.5 mm.

Length, 13.5 to 18 mm., breadth, 9 to 12 mm.

Type.— ♂ ; La Mesa, Dona Ana County, New Mexico; June 21, 1927.

Allotype.— ♀ ; same data as type.

Paratypes.—1 ♂ ; same data as type. 12, specimens of both sexes; Mesquite near Mesille Park, New Mexico; July 12, 1917.

Trox (Trox) plicatus new species (Pl. IV, fig. 10.)

The long hair on the elytral tubercules, smaller size and male genitalia will serve to distinguish this species from *sonorae* and the other species in this complex group. On some of the specimens seen the setae on the elytral tubercules is brownish.

Oblong, moderately shining; dark brown to black; antennal club rufous, hairs on basal joint light brown.

Clypeus rounded with a well impressed suture at base. Head coarsely and closely punctured, bituberculate; each tubercle bearing a patch of light brown hair on its summit.

Sides of thorax gradually converging to apex; base sinuate on each side. Median sulcus bordered on each side by parallel ridges; transverse elevation at middle obsolete or nearly so. Declivity on each side of median ridges with a low tubercule half way to margin. Margins explanate. Ridges, tubercules and explanate margins coarsely punctured and each puncture bearing a brownish hair.

The first two rows of tubercules on the elytra are strongly elevated and the tubercules are confluent longitudinally forming a long carinae. The next two rows are distinct but not confluent. Regular patches of lurid setae placed on the summits of these tubercules. Intervals between large tubercules with smaller ones, some of which are hair bearing. Between each large and small row of tubercules is a row of rather deep punctures, some of these punctures have one or two minute tubercules on their rim.

Prosternal process triangular, acute. Anterior tibiae with marginal tooth one-third from apex, senate near base. Anterior spur declinate, acute in male and straight, slender and acute in female.

Length, 10.1 to 11.4 mm.; breadth, 4.3 to 5.5 mm.

Type.—♂; Palmerlee, Cochise County, Arizona; July 8, 1907.

Allotype.—♀; same data as type.

Paratypes.—39 specimens of both sexes: 21; with same data as type. 18; Carr Canyon, Huachuca Mountains, Cochise County, Arizona; August, 1905, (H. Skinner); [Acad. Nat. Sci. Phila.].

Trox (Trox) contractus new species (Pl. IV, fig. 11.)

The color of the antennal hair and the male genitalic characters are the main distinctions between this species and *sonorae* Lec.

Oblong, not very shining; blackish; antennal club and hairs on scape fulvous.

Clypeus rounded, with a pit on each side basally. Head with barely a trace of any tubercules, coarsely and rather densely punctured.

Thorax three-fifths as long as wide; sides arcuate, narrower in front, a little convergent behind to a well defined hind angle; base sinuate on each side near the angles. Median sulcus on each side bordered by longitudinal ridges, these ridges are connected medially by a transverse ridge. Midway between the median ridge and the margin is a nodule with connecting ridges nearly to the anterior angle, posterior angle and base of median ridge. These ridges and nodules are coarsely and closely punctured.

The large tubercules on the elytra are for the most part separated from each other longitudinally by tufts of squamose like setae, at no place are these tubercules very high. The intervals have smaller tubercules which are setae bearing; also a double row of punctures, each puncture with two or more small granules near the rim. Elytral margin serrate, especially basally.

Prosternal process small, truncate. Anterior tibiae with marginal tooth nearly one-half from apex to base, serrate near base.

♂. Anterior tibial spur straight, down turned in anterior one-fourth, tip obliquely truncate.

♀. Anterior tibial spur straight, acute.

Length, 9.46 to 10.56 mm.; breadth, 5.28 to 5.72 mm.

Type.—♂; New Braunfels, Comal County, Texas.

Allotype.—♀; same data as type.

Paratypes.—1 ♀; same data as type. 3 ♂; Texas.

Trox (Trox) hamata new species (Pl. IV, figs. 7 and 13.)

The unusual sexual characters, plus the long hairs on the elytral tubercules will distinguish *hamata* from all others in the eastern states.

Oval, not very shining, blackish, pronotum sometimes lighter in color.

Clypeus subangulate; head transversely quadri-tuberculate; there is an obtuse carina extending forward from the two outside tubercules to the edge of the clypeus. Head densely and coarsely punctured; the punctures are separated by about one-half their diameter.

Thorax three-fifths as long as wide; sides slightly arcuate in anterior four-fifths then abruptly converging to the hind angles which are well defined. Base rounded medially then narrowed to the angles. Median ridges on disk are strongly sinuous forming an anterior and posterior foveae. There is a larger and deeper foveae on each side of the posterior one.

Elytral tubercules elongate on sides and apex, well developed with erect long setae on their summits. On each side of the tubercules are a row of coarse punctures, these have a small tubercule on each of two to four sides. The surface between the punctures is rugous with occasional tufts of setae.

Prosternal process short, acute. Anterior tibiae with a small tooth one-third from tip. Middle tibiae with a small tubercule on the outer edge near the middle.

♂. Hind tibiae flatened, not quite one-half as wide as it is long, with a blunt wide tubercule on the outer side. The inner side has a hook like process near the apex. Anterior tibial spur short, thick, down curved, acute at tip.

♀. Hind tibiae is one-third as wide as long. Anterior tibial spur long, slender, straight, acute.

Length, 5.28 to 6.16 mm.; breadth, 3.08 to 3.72 mm.

Type.—♂; Mount Misery, Burlington County, New Jersey; July 1, 1937; (Mark Robinson).

Allotype.—♀; same data as type.

Paratype.—932 specimens of both sexes, from the following localities:

NEW YORK: 1, Ithaca, June 20, 1893. 1, Ithaca, June 28, 1937, (P. Babiy). 1, Flushing, March 19, 1930. 1, Flushing, September. 1, New York City.

NEW JERSEY: 61, Mount Misery, July 1, 1937 to June 17, 1938, (Mark Robinson). 12, Mount Misery, July 8, 1934 to July 14, 1935, (L. J. Bottimer). 2, Hooton Hill, August 19, 1930, (R. J. & M. B. Sim). 20, Marlton, May 8, 1935 to April 22, 1936, (Mark Robinson). 29, Brown's Mills, June 5, 1935 to June 21, 1936, (Mark Robison). 20, Rancocas Park, June 8, 1935 to June 6, 1936, (Mark Robinson). 1, Rancocas Park, June 28, 1929, (R. J. & M. B. Sim). 1, Rancocas Park, June 28, 1935, (R. C. Casselberry). 15, Cecil, June 26, 1937, (Mark Robinson). 78, Sea Side Park, July 10, 1937 to June 24, 1939, (Mark Robinson). 35, Whitings, July 7, 1938 to August 18, 1938, (Mark Robinson). 172, Haddon Heights, April 20, 1931 to May 21, 1936, (L. J. Bottiner). 49, Riverton, June 25, 1930 to July 21, 1931. 30, Aldine, June 22, 1930, (R. J. & M. B. Sim). 14, Medford, July, 1937. 17, Warren Grove, June 11, 1937, (Mark Robinson). 7, Ocean City, June 30, 1935, (R. C. Casselberry). 2, Taunton, June 26, 1932, (L. J. Bottimer). 15, Moorestown, June 21, 1929 to July 7, 1929, (R. J. & M. B. Sim). 1, Bridgeboro, July 15, 1929, (R. J. Sim). 1, New Lisbon, May 7, 1930, (R. J. Sim). 1, Alloway, July 31, 1930, (R. J. Sim). 3, Riverside Height, July 24, 1929, (R. J. Sim). 1, Jericho, July 31, 1930.

PENNSYLVANIA: 43, Bucks County, May 30, 1935, (Mark Robinson). 38, Delaware County, July 1, 1934 to August 12, 1934, (Mark Robinson). 26, Downingtown, July 21, 1935 to May 30, 1936, (Mark Robinson). 25, Broomall, 1934, (Mark Robinson). 1, Canadensis, July 5, 1931, (Sim). 14, Philadelphia, 1934, (Mark Robinson). 1, Glenolden, June 20, 1937, (R. C. Casselberry). 1, Lansdowne, June 15, 1935, (R. C. Casselberry). 3, State College, 1935. 1, Nottingham Barrens, May 16, 1936.

MARYLAND: 19, Silver Springs, May 13, 1932 to February 24, 1933, (L. J. Bottimer). 2, Beltsville, June 29, 1939, (L. J. Bottimer).

SOUTH CAROLINA: 85, C.C.C. Camp F2, Oconee County, June 23, 1938, (O. L. Cartwright). 67, C.C.C. Camp F2, Oconee County, July 10, 1937,

(O. L. Cartwright). 81, Sassafras Mountain, June 16, 1937 to July 20, 1937, (O. L. Cartwright). 5, Fish Hatchery, Oconee County, June 27, to November 3, 1937, (O. L. Cartwright). 10, Walhalla, July 10, 1937, (O. L. Cartwright). 24, Clemson College, May 18, 1931 to June 23, 1937, (O. L. Cartwright).

GEORGIA: 1, Atlanta, June 1, 1937 (P. W. Fattig).

Trox (Trox) spinulosus new species (Pl. IV, figs. 5 and 15.)

Except for the hind tibiae, which in this species is two-ninths as wide as long in both sexes and the male genitalia, this species is indistinguishable from *hamata*.

Type.— ♂ ; La Salle, Monroe County, Michigan; September, 1936; (Mrs. J. C. Bottimer).

Allotype.— ♀ ; La Salle, Michigan; June, 1936; (Mrs. J. C. Bottimer).

Paratypes.—258 specimens of both sexes; La Salle, Michigan; various dates from May 1931 to June 1937; (Mrs. J. C. Bottimer).

Trox (Trox) dentibius new species (Pl. IV, figs. 4 and 14.)

This species is perhaps more nearly related to *aciculeatus* from which it can be distinguished by the wider hind tibiae and male genitalic characters.

The head and thorax are essentially the same as *hamata* and the elytra differs only in the hair bearing tubercules being smaller and more numerous. Posterior tibiae two-sevenths as wide as long in both sexes. The tubercule midway to apex on the outer side is long and acute.

♂. Anterior tibial spur acute, down bent at tip.

♀. Anterior tibial spur truncate, longer, down bent at tip.

Type.— ♂, Palmerlee, Cochise County, Arizona; June 2.

Allotype.— ♀ ; same data as type.

Paratypes.—2 ♂, 7 ♀ ; Huachuca Mountains, Cochise County, Arizona; August 1, 1919.

Trox (Trox) aciculeatus new species (Pl. IV, fig. 3.)

This species belongs in with the long setae part of the *insularis* group while its genitalic characters are in affinity with the short setae part.

Head, thorax and elytra are the same as *dentibius*. Posterior tibiae one-fourth as wide as long in both sexes, the median tubercule as usual in the *insularis* group.

♂. Anterior tibial spur long, slender, down curved at tip, probably acute when not worn.

♀. Anterior tibial spur shorter, thicker, down curved at tip, acute.

Type.— ♂ ; Hope, Arkansas; May 9, 1926; (L. Knobel).

Allotype.— ♀ ; same data as type.

Paratypes.—2 ♀ ; same data as type. 1 ♂ ; Willard, Green County, Missouri; June 4. 1 ♂ , 3 ♀ ; Washington County, Arkansas; July 17, 1938 and April 12, 1938. 1 ♀ ; Mount Sequoyah, Washington County, Arkansas; June 19, 1938.

Trox (Trox) simi new species (Pl. IV, fig. 5.)

In *simi* the large tubercules on the elytra are larger and fewer than on any other species of the *insularis* group. This rather rare species has been taken feeding on hen feathers, mouse hair, dead crow, dead mole, old carpet and owl pellets.

Ovate; opaque with tips of anterior tibiae and elytra shining.

Clypeus subangulate; margine fimbriate; head with four hair bearing obtuse tubercules, one on either side of the center and one in front of each eye. Head and clypeus quite coarsely and densely punctured; the punctures are separated by less than their own diameters. Thorax seven-elevenths as long as wide.

Sides of thorax arcuate converging in front, sinuate in front of well defined hind angles. Base slightly sinuate near the hind angles. Side and posterior margins with a single row of squamulose setae. Two rather triangular shaped foveae arranged in tandem along the median line with one on either side and slightly in advance of the posterior one; a transverse foveae anteriorly on each side extending down to the explanate sides. The ridges separating the foveae are covered with short setae.

Elytra widest just behind the middle; margin with a single row of short setae. The large tubercules of the elytra are round to oval except for two or three near the base which are elongate; between these rows of large tubercules are rows of smaller tubercules also bearing brownish hairs; between these rows is a row of coarse punctures; each puncture has a minute tubercule on each side laterally.

Prosternal process obsolete or nearly so. Abdominal segments densely punctured along the anterior half. Anterior tibiae with a small tooth one-third from tip. Spur slender, contracted near the tip, a little more down curved at tip in the male than in the female, acute.

Length, 5.3 to 6.4 mm.; breadth, 3.1 to 3.5 mm.

Type.— ♂ ; Moorestown, Burlington County, New Jersey; June 17, 1930; (Robert Sim; Owl pellets).

Allotype.— ♀ ; Stow Creek, Salem County, New Jersey; May 21, 1932; (Robert Sim).

Paratypes.—1 ♂, 2 ♀; same data as allotype. 2 ♂; Riverton, New Jersey; June 10, 1931 and June 17, 1930; (R. Sim. 1 ♂; Bridgeboro, New Jersey; July 15, 1929; (R. J. & M. B. Sim). 1 ♂; Bayside, New Jersey; July 19, 1929. 1 ♂, 1 ♀; Whitings, New Jersey; August 18, 1938; (Mark Robinson). 1 ♂, 1 ♀; Dismal Swamp, Virginia; July 22; (G. P. Engelhardt). ♀; Delaware County, Pennsylvania; July 7, 1934; (Mark Robinson). 1 ♂; Jericho, New Jersey; July 1, 1930; (R. J. Sim).

Trox (Trox) variolatus monticola new subspecies (Pl. IV, fig. 16.)

This subspecies is found in the mountains or the colder part of the range of typical *variolatus* Melsheimer. It can be separated from the typical form by its wider and flatter elytral intervals between the rows of tubercules which are for the most part more elongate. The genitalic characters are identical.

Type.—♂; Pocono Mountains, Pike County, Pennsylvania; July 5, 1936; (Mark Robinson).

Allotype.—♀; same data as type.

Paratypes.—1 ♂; same data as type. 1 ♀; Pocono Mountains, Pennsylvania; May 23, 1936; (Mark Robinson). 2 ♂, Canadensis, Pennsylvania; July 5, 1931; (R. J. Sim). 1 ♂, 3 ♀; Canadensis, Pennsylvania; September 24, 1930; (R. J. Sim). 15 of both sexes; Bar Harbor, Maine; July 4, 1937; (A. E. Brower). 1 ♂; Toronto, Ontario; August 9, 1924; (H. Dietrich). 1 ♀; Mammoth Cave, Kentucky; July 8, 1924. 1 ♀; Stowe, Vermont; June 21, 1913; (G. P. Engelhardt).

Trox (Trox) aequalis affinis new subspecies (Pl. IV, fig. 8 and 9.)

All the specimens examined have the same slight genitalic difference from *aequalis* Say (Fig. 8) and by far the most are much larger than the stem species. There is very little difference in the size of *aequalis*: the maximum seems to be, length, 6.3 millimeters; breadth, 3.3 millimeters. *Trox affinis* may be endemic to crow's nests. Further collecting will clear up this angle.

Elongate, oval; not very shining except the legs.

Clypeus subangulate at middle, entire edge reflexed; margin of head fimbriate. Head rather coarsely and densely punctured except for two spots on center of head which are not quite so densely punctured but are surrounded by short scale-like hair.

Thorax four-sevenths as long as wide. Sides and posterior edge with a single row of rather coarse hairs. Sides of thorax explanate and evenly arcuate; hind angles distinct. Discal area with four very shallow foveae. The punctures are rather sparse but gradually increase towards the sides until along the edge they are confluent. Center area of pronotum with short setae except along the median line.

Elytra nearly parallel; outer edge setaceous. Striae are coarsely and deeply punctured, Intervals barely convex, with patches of setae arranged in double rows. Humeral umbone punctured; each puncture bearing a short hair.

Prosternal process long cariniform. Anterior tibiae with one, two or three small teeth above apical prominence which is bidentate. Spur thick, down curved and truncate at tip, a little thicker in the male sex.

Length, 6.8 to 8.6 mm.; breadth, 3.5 to 4.6 mm.

Type.—♂; Moorestown, Burlington County, New Jersey; July 10, 1931; (Robert Sim; crow's nest).

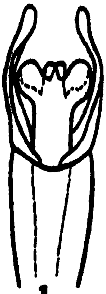
Allotype.—♀; same data as type.

Paratypes.—34 of both sexes; Moorestown, New Jersey, various dates in July 1929; (Sim). 17 of both sexes; Rancocas park, New Jersey, various dates in July 1929. 5 of both sexes, Finn Point, New Jersey; July 9, 1929. 1 ♀; Bridgeboro, New Jersey; June 29, 1929; (Sim). All paratypes taken in crow's nests.

EXPLANATION OF PLATE IV

(Figures not to scale.)

Fig. 1.—*Trox* (*Trox*) *foveicollis* Harold. Dorsal view of genitalia.
Fig. 2.—*Trox* (*Trox*) *insularis* Chevrolat. Dorsal view of genitalia.
Fig. 3.—*Trox* (*Trox*) *aciculeatus* new species. Dorsal view of genitalia.
Fig. 4.—*Trox* (*Trox*) *dentibius* new species. Dorsal view of genitalia.
Fig. 5.—*Trox* (*Trox*) *simi* new species and *spinulosus* new species. Dorsal view of genitalia.
Fig. 6.—*Trox* (*Trox*) *terrestris* Say. Dorsal view of genitalia.
Fig. 7.—*Trox* (*Trox*) *hamatus* new species. Dorsal view of genitalia.
Fig. 8.—*Trox* (*Trox*) *aequalis* Say. Dorsal view of genitalia.
Fig. 9.—*Trox* (*Trox*) *aequalis affinis* new species. Dorsal view of genitalia.
Fig. 10.—*Trox* (*Trox*) *plicatus* new species. Dorsal view of genitalia.
Fig. 11.—*Trox* (*Trox*) *contractus* new species. Dorsal view of genitalia.
Fig. 12.—*Trox* (*Omorgus*) *nodosus* new species. Dorsal view of genitalia.
Fig. 13.—*Trox* (*Trox*) *hamatus* new species. Left tibia of male.
Fig. 14.—*Trox* (*Trox*) *dentibius* new species. Left tibia.
Fig. 15.—*Trox* (*Trox*) *spinulosus* new species. Left tibia.
Fig. 16.—*Trox* (*Trox*) *monticola* new species. Dorsal view of genitalia.



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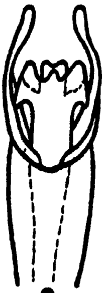

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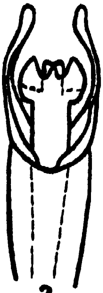

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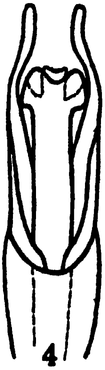

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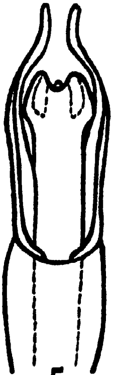

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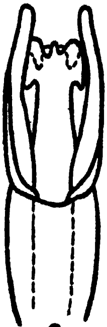

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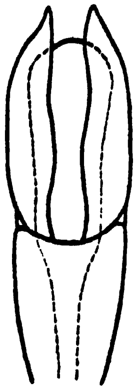

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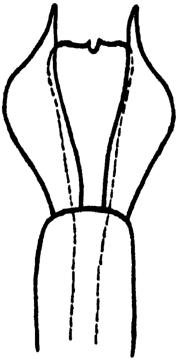

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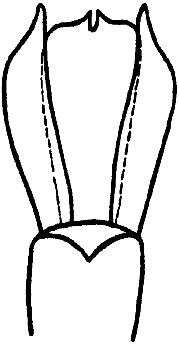

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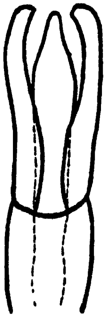

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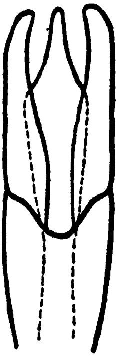

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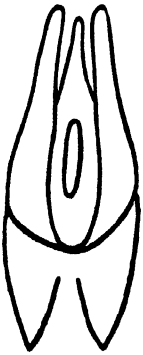

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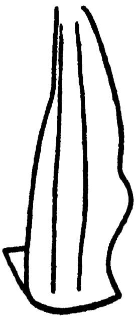

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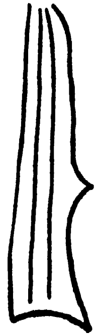

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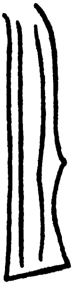

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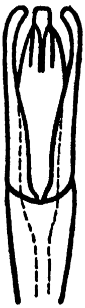

16

ROBINSON—AMERICAN SCARABAEIDAE

A GENERIC REVIEW OF THE ITHOMIINAE

(LEPIDOPTERA, NYMPHALIDAE)

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(Plates V to VIII)

The lepidopterous subfamily *Ithomiinae* is a compact group of genera confined exclusively to the American tropics. It belongs to the family *Nymphalidae* and is related to the holotropic subfamily *Danainae*.[1] This paper recognizes thirty-five genera, two of which are new, and groups the genera into three tribes. The generic synonymy is summarized and each of the genera is defined with particular emphasis on the venation of the hind wings. The present paper is intended to serve as a study preliminary to a series of papers dealing comprehensively with the species.

An extensive examination of visible external characters of possible generic value has led to the conclusion that in the case of the *Ithomiinae* the scale patch of the males and the venation of the hind wings in both sexes offer characters sufficient for distinguishing each genus. It is not to be assumed, however, that venation is regarded as the only criterion. Venation is used here because it seems to be consistently and reliably correlated with other characters, thus fortunately affording a convenient uniform basis for generic determination and for keying. The venation of the fore wings appears to be somewhat less satisfactory for separating these genera. The male genitalia can be used usually to separate both species and genera, but must be employed judiciously and are not adequate alone; they are not discussed in this paper. Other characters of merit are to be found in the antennae and legs, but these are of assistance chiefly in dividing the genera into tribes. Wing color and pattern are virtually worthless for generic identification, due to that remarkable phenomenon, exemplified in the *Ithomiinae,* which has been called " mimicry ".

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[1] See Forbes, "Revisional Notes on the Danainae", *Ent. Amer.*, XIX, pp. 101-140, (1939). I concur with the introductory discussion on pp. 101-105 expounding the general problem. Referring to the genealogy map on p. 103, Dr. Forbes recently told me that he would derive *Ithomiinae* as a twig branching from the main trunk earlier than *Clothilda*.

The synonymy of the genera has been exhaustively explored. It is intended in this paper to account for every generic name proposed in *Ithomiinae* and to identify the genotypes correctly. No attempt is made to follow the many misapplications, expecially of the older generic names, through the literature.

Genotypes are regarded as important only from the viewpoint of nomenclature. As defined here the genera by no means are based on genotypes alone. Certain genera, especially large ones, have considerable range of variation among the species with respect to any given character. An attempt has been made to diagnose genera for associating species on the basis of all pertinent characters, although the conclusions are summarized in terms of a comparatively few, though significant, features.

In more than one instance in the *Ithomiinae* two species, on which are based different generic names, can be separated easily with respect to normally generic elements, but a survey of other species demonstrates gradual intergradation and requires that the two be placed in the same genus in order to avoid artificial and arbitrary generic delineation. It is believed that the genera recognized here are all homogeneous. The conclusions are based on a study of the species available in the collections of the Academy of Natural Sciences of Philadelphia, the American Museum of Natural History, the United States National Museum, and the Cornell University collection; statistically, more than four-fifths of the named forms have been examined.

It is felt that this paper defines the genera more positively than has been done in any single study since Doubleday, Hewitson and Westwood's work [2] nearly a century ago, Godman and Salvin's Central American work,[3] and Schatz's summary.[4] In certain cases the result is the shifting of species from traditional generic associations; those who may have occasion to use the keys here are warned that not all species will fit in the genera to which they were referred by Haensch,[5] Bryk [6] and other workers.

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[2] Genera of Diurnal Lepidoptera, (1846).

[3] Biol. Cent. Amer., Rhopalocera, (1879).

[4] Fam. Gatt. Tagfalt., (1886).

In order to more adequately reflect the present author's conceptions of generic scope, a list of species and subspecies follows each description of generic characters. These lists, in main, follow the specific synonymy found in Bryk [6] and intentionally represent nothing new in the way of species identifications; variations from Bryk's list occur in a few cases where recent studies or my own observations indicate the necessity. All species and subspecies listed have been examined by me where marked with the dagger (†); those not so marked are included tentatively as probably belonging to the genus under which they are found. As previously noted, it is hoped that this paper will be followed by a series of studies dealing with the species of each genus.

With the introduction of tribes, largely based on leg characters, an attempt is made to offer a generic sequence which will reflect phylogenetic relationship.

The primitive tribe, *Tithoreini*, is easily separable by the well developed tibia and tarsus of the male fore-legs. The female foretarsus is five-jointed. The venation is generalized, with no hint of reduction and is rather similar in both sexes. Godman and Salvin [3] first recognized these genera as being the most primitive. It is characteristic to find the species of most of these genera confined to the mountains and represented by only a few forms each; supposedly such genera are survival groups, probably isolated by glaciation.

The proper separation of the remaining genera is problematic and no pat character seems available. All have reduced or vestigial tibia and tarsus on the fore-legs of the males.

In general the *Ithomiini* have four joints in the tarsus of the female fore-leg, while in the *Oleriini* there are five. A single but important exception is *Dircenna*, which has four female foretarsal joints, but which certainly should be associated with *Corbulis* and *Oleria*.

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[5] In Seitz, Grossschm. Erde, 5, *Ithomiinae*, (1909).

[6] Catalogus Lepidopterorum, pars 80, *Ithomiinae*, (1937).

In the *Ithomiini* two main lines may be recognized. The series from *Xanthocleis* to *Scada* is rather homogenous, shares a tendency for the subcostal vein in the females to shorten and then to coalesce basad with the radius. The male hair patch and the discocellulars likewise exhibit kinship. *Aeria* and *Velamysta* are added to this series tentatively. The other line runs through *Ithomia* and *Hypothyris* to *Napeogenes*. These share the peculiar convexity of the radial vein near the base and exhibit the steps of development toward the festoon-arranged discocellulars of *Napeogenes*.

The *Oleriini* often show considerable difference between the venation of the males and of the females. There is a marked tendency for atrophy and vein reduction in the wings, yet all but one of these genera retain the primitive number of tarsal segments in the female. *Dircenna* must be regarded as having undergone leg reduction independently of the genera of the tribe *Ithomiini*.

It seems desirable not to subject the familiar names for larger categories to any change until the International Commission on Zoological Nomenclature sets up procedure for uniform practice, consequently the name *Ithomiinae* is here retained because of its wide acceptance.

While a number of familiar generic names are synonymized under less familiar but prior names, only one familiar name has been shifted from one group of species to another: Scudder's designation of a genotype for *Ceratinia* Hübner requires the usage employed by Bryk [6] and followed herein, by which the mistaken application used by some German authors is corrected.

VENATION CHARACTERS

The veins near the proximal part and the posterior part of the hind wing are more constant, those near the cell apex and the wing apex are quite variable.

The humeral vein (hum) is found in six different forms: It may be simple and unstalked as in *Aeria, Oleria, Eutresis, Episcada, Dircenna, Scada, Pseudoscada, Corbulis, Greta, Heterosais;* it may be bifid, but the distal arm so weakly developed as to be a mere lobe, as in *Pteronymia, Ceratinia,* and *Callithomia*; it may be bifid with both arms weakly developed, as in *Placidula, Elzunia, Tithorea, Athyrtis* and *Olyras*; it may be bifid, both arms rather equally developed, as in *Thyridia, Hyposcada, Miraleria, Hypothyris, Patricia, Athesis, Xanthocleis, Mechanitis, Sais, Velamysta, Napeogenes, Ithomia, Godyris, Mcclungia* and *Hypoleria*; in *Hyalyris* the distal arm of the bifid humeral is unusually long; in *Melinaea,* the humeral is bifid, the distal arm normally developed, but the proximal arm a little short. The humeral is found to be consistent to both sexes and throughout any given genus. Its importance first was noticed by Kremky[7] who recognized two types, bifid and non-bifid.

A hair patch unique to and characteristic of the *Ithomiinae* is found in the males at the costal side of the cell of the hind wing; in one genus only, *Thyridia,* it is found in the females as well. The hair patch is constant within a genus and represents a good character. In most of the genera there is one long patch which extends from the base to the cell apex, the hair scales arising just posterior of the radial vein and forming a tuft normally laid in a proximo-distal direction. Sometimes the wing directly under this tuft and between the subcostal and radial is raised ventrad, as in *Ithomia.* In a few genera there are two hair patches, always of unequal size, one at the base and one at the apex of the cell. In some the basal patch is large and brush-like, while the distal patch is fine and pencil-like; in other genera the reverse is true.

The anal veins (1A and 2A) and the cubital veins (Cu_1 and Cu_2) exhibit too slight variation to be of much value. In this paper, however, the cubitals are used as points of reference in locating positions of curvature on the radial vein.

In the *Ithomiinae* the subcostal (Sc) and the radial (R) veins usually are closely associated near the base. In one or two presumably primitive genera (for example *Elzunia*) Sc and R separate proximal of hum, but usually Sc and R coalesce at least as far as hum. Often Sc and R do not separate for some distance distal of hum; proximal of their separation they are either wholly coalesced or they run side by side. By " coalesced " is meant merged and combined into one.

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[7] Kremky, Ann. Zool. Mus. Pol. Hist. Nat., 4, (1925).

In the distal portion of the wing Sc and R offer valuable characters which need careful evaluation. As noted below in describing the venation of the various genera, Sc is found in several degrees of atrophy. The most marked reduction is found in *Pseudoscada* where Sc in males of some of the species is only a vestigial protuberance or a thread-like spur on R. More commonly Sc is reduced near the cell apex so that it fails to reach the margin. Mostly the degree of reduction of Sc may be taken as a consistent generic characteristic, but this is not always so; in the genera where Sc nearly but not quite reaches the margin, individuals are found in which Sc is complete, usually sharply up-curved in the part missing in more typical examples.

In the females Sc and R more frequently coalesce beyond hum than in the males. In the two closely related genera, *Mechanitis* and *Sais,* as well as in *Velamysta,* Sc and R are wholly merged in the basal part, separating only near the cell apex, where Sc angles off steeply to the costal margin. To a less degree this same kind of tendency is found in such genera as *Callithomia, Xanthocleis* and *Greta.* But terminal atrophy is not found in females at all, and Sc invariably reaches the margin.

In the genera related to *Hypothyris,* R curves down into the cell near the base, making to the cell a convex arch opposite the cubitals. R also undergoes various modifications at and beyond the cell apex. In some genera, *Thyridia* for example, it angles forward at the discocellulars. In *Godyris* it recurves into the first median and is coalesced with it from there to the margin. In *Mcclungia,* described in this paper as new, the terminal segment of R is entirely wanting. In a few other cases it is reduced so that it fails to reach the margin.

The first discocellular (1d) is often a generic character in its angle with R and in its length. When 1d is short, it tends in both sexes to be wanting in many individuals. The phrase " anterior side of the cell " refers to the distance from the base of the cell to the cell apex, which always is taken to be the point where R meets the discocellulars.

The second discocellular (2d) usually is present, but its angle and curvature are often only of specific value. In the females of *Greta* it is wanting. In males of *Heterosais* 2d has no posterior connection and the cell is open.

The third discocellular (3d) usually is long and well developed, but in males of several presumably specialized genera (*Godyris, Greta, Hypoleria, Pseudoscada*) it is reduced at its anterior end and the cell is open.

Two recurrent veins appear in *Ithomiinae,* as for example in *Eutresis,* but commonly it is the median recurrent (Mr) only which is present. This varies considerably in position and size and may or may not be of generic value. The position of Mr usually is constant in a genus in relation to its distance from R and Cu_1, but without varying this relative position, may arise on 2d, on 3d or opposite M_2. When it is emitted by a discocellular, it usually is placed on the apex of an angle of that discocellular. While the length of Mr often is characteristic of a genus (as in *Mechanitis, Corbulis*), in such genera as Ithomia, both the length and position are matters of individual variation.

The first median vein (M_1) tends to merge with R. When this occurs, 1d is wanting. In many genera it is characteristic, especially in females, for M_1 to stalk with R at the cell apex. In females of *Godyris* and *Hypoleria* M_1 normally stalks with R midway between cell apex and margin. In males of *Pteronymia* M_1 is typically wholly merged with R; some species of that genus have a minute M_1 branching from R at the margin. They are wholly merged in both sexes of *Heterosais.*

The second median (M_2) is commonly present and arises at the discocellulars. In females of *Greta* M_2 and M_1 are stalked beyond the cell. In males of *Hypoleria* M_2 is reduced distally and fails to reach the margin. In males of *Greta* M_2 is reduced at its proximal end and is not connected with any other vein.

The third median (M_3) is rather constant, never undergoes reduction and exhibits little variation. When the phrase "posterior side of cell" is used, it refers to the distance from the base of the cell to the proximal end of M_3.

For convenience the proximal portion of Cu_1, which bounds part of the cell, is called the fourth discocellular (4d).

PREPARATION OF WING MOUNTS AND PLATES

For comparison and for the preparation of some of these plates, wings were bleached and mounted as slides. A word on the method may be of interest; the steps of preparation:

1. Detach wings on right side; label pinned remainder with a serial number to appear later on the slide label.
2. Wet detached wings in 95% alcohol.
3. Bleach in Labaraque's solution (NaClO) until the desired transparency is reached, but not so long that the wing tissue becomes too soft for easy manipulation.
4. Dehydrate in alcohols (a few minutes each in 50%, 70% and 95%).
5. Clear in xylene.
6. Mount in damar or balsam.

For wings too large for ordinary microscopic slips, the thin glass oblongs manufactured for covers for lantern slides serve very well. Care must be taken to avoid tears or folds in the wings when mounting. Such mounts are convenient for study and often reveal venation details otherwise difficult to observe or to evaluate.

The venation figures with this paper all were drawn from enlarged projections, either of the prepared wing, or of undetached, unbleached wings through which very strong light was passed. The hair patch of the males is indicated diagramatically by transverse lines.

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KEY TO THE GENERA

The key which follows is based on characters of the hind wings. While it is intended to cover all usual variations in venation, it is inevitable that abnormal specimens will occur which the key fails to cover. The great difference with respect to venation frequently found between the sexes of *Ithomiinae* requires the use of separate sections of the key for males and females. These keys are artificial.

MALES

1. Two hair patches at the costal margin............................2
One hair patch at the costal margin............................9

2. Cell open 3
Cell closed 4

3. M$_1$ and 2d wanting; 1d pointing basad, free at its posterior end, or represented by a slight projection below R; Sc atrophied at or before the apex of cell; 3d complete.
Heterosais Godman & Salvin (p. 204)
M$_1$ present though often not reaching margin; 1d and 2d present, complete; Sc atrophied well beyond cell apex; 3d atrophied at its anterior end, not reaching M$_2$....*Hypoleria* Godman & Salvin (p. 199)
M$_1$ atrophied before reaching margin; terminal segment of R wanting; 1d present; Mr short, arising opposite M$_2$; Sc atrophied near end of cell, strongly down-curved near its termination.
Mcclungia new genus (p. 201)

4. Basal patch large, brush-like; distal patch small, pencil-like..........5
Basal patch small, pencil-like; distal patch large, brush-like..........7

5. Non-bifid hum; anterior side of cell longer than posterior side; 1d shorter than 2d, which is curved.
Dircenna Dbld., Hew. & Westw. (p. 196)
Bifid hum 6

6. Anterior side of cell shorter than posterior side; 1d longer than 2d, which is straight...........*Tithorea* Dbld., Hew. & Westw. (p. 175)
Anterior and posterior sides of cell nearly the same length; Sc and R sharply recurved, thickened, forming an open rectangular auxiliary cell opposite the cell apex..............*Velamysta* Haensch (p. 184)

7. Sc atrophied before reaching margin; 2d straight; Mr arising from angled 3d................................*Patricia* new genus (p. 177)
Sc complete 8

8. Mr arising from angled 2d, long, reaching into cell at least as far as 4d. *Melinaea* Hübner (p. 178)
Mr arising from angled 2d, short, not reaching basad as far as 4d. *Olyras* Dbld., Hew. & Westw. (p. 176)

9. Cell open, 3d atrophied anteriorad 10
Cell closed 12

10. Bifid hum; Sc atrophied near end of cell, not reaching margin; Mr arising from posterior extremity of 2d; R inosculating with M_1 near margin, the two veins forming with 1d a closed auxiliary cell. *Godyris* Boisduval (p. 200)
Non-bifid hum 11

11. Sc atrophied near cell apex; R atrophied near margin or recurving into M_1 forming an auxillary cell; M_2 proximally atrophied. *Greta* Hemming (p. 203)
Sc vestigial, usually a mere knob on R opposite Cu_2, sometimes a short, slender projection from Sc near base; R atrophied distally, but never inosculating with M_1..*Pseudoscada* Godman & Salvin (p. 203)

12. Hair patch raised ventrad, compactly ovate........................13
Hair patch if raised ventrad is well elongated, not ovate............14

13. Hair patch over cell formed between Sc and R and closed distad with an auxiliary vein; anterior side of cell somewhat longer than posterior side; 3d convex to cell..............*Ithomia* Hübner (p. 185)
Hair patch over cell open distad, no auxillary vein present; anterior and posterior sides of cell nearly the same lengths; 2d and 3d both nearly straight, parallel..................*Miraleria* Haensch (p. 186)

14. Bifid hum long, both arms short.....................................15
Bifid hum with distal arm reduced to a mere lobe.......................16
Non-bifid hum 18
Bifid hum with both arms well developed...............................26

15. Wings broad; posterior side of cell much longer than anterior side. *Elzunia* Bryk (p. 176)
Wings narrow; anterior side of cell much longer than posterior side; Sc and R separate well beyond hum....*Placidula* d'Almeida (p. 187)
Wings narrow; anterior side of cell much longer than posterior side; Sc and R separate at hum.................*Athyrtis* Felder (p. 180)

16. M_1 wanting, or stalking from R at margin. *Pteronymia* Butler & Druce (p. 197)

M_1 present, arising at cell..17

17. Sc atrophied proximal of cell apex; cell nearly reaches margin; Mr always on the angle of 2d................*Callithomia* Bates (p. 194)

Sc complete; cell two thirds of wing length; 2d more than twice the length of 1d; Mr on 2d, 3d or opposite M_2..*Ceratinia* Hübner (p. 192)

Sc complete; cell about half the wing length; 2d and 1d nearly the same length; Mr always on the angle of 3d.
Hyposcada Godman & Salvin (p. 193)

18. Sc atrophied near end of cell..19

Sc complete 20

19. Mr. very long, placed as a continuation of M_2 or arising from the acute angle of 3d which is at the extreme anterior end of 3d; 2d nearly straight..........................*Corbulis* Boisduval (p. 195)

Mr longish, placed at the angle of 3d. the anterior arm of which is as long as 1d; 2d strongly convex to cell.
Dircenna Dbld., Hew. & Westw. (p. 196)

20. Anterior and posterior sides of cell about the same length, or posterior side sloghtly longer..21

Anterior side of cell definitely longer than posterior side............23

21. 2d twice the length of 1d......................*Oleria* Hübner (p. 193)

2d shorter than twice the length of 1d..............................22

22. Sc opposite cell apex usually separated from R by a distance greater than the length of the shortest discocellular present; anterior angle formed by 3d with 4d acute..................*Aeria* Hubner (p. 185)

Sc opposite cell apex usually separated from R by a distance less than the length of the shortest discocellular present; anterior angle formed by 3d with 4d obtuse.........................*Scada* Kirby (p. 183)

23. Mr. very long, arising opposite M_2 or from the angle of 3d, the anterior arm of which is minute; often a second developed or vestigial recurrent on the midpoint of 3d.
Eutresis Dbld., Hew. & Westw. (p. 179)

Mr arising from the angle of 3d, the anterior arm of which is at least as long as 1d; no vestige of another recurrent....................24

24. 2d straight; distal segment of R shorter than the greatest width of the cell; Mr quite short.........................*Oleria* Hübner (p. 193)

2d convex to the cell; distal segment of R longer than the greatest width of the cell; Mr longer..25

25. R angled upward at 1d.......*Dircenna* Dbld., Hew. & Westw. (p. 196)

R not angled at 1d.............*Episcada* Godman & Salvin (p. 198)

26. Proximal end of M_1 not distal of proximal end of M_3; R and Sc stalk distal of hum; costal margin angled proximal of cell apex.
Thyridia Hübner (p. 180)

Proximal end of M_1 distal of proximal end of M_3.................27

27. Mr on angle of 2d or opposite M_2; discocellulars not festoon-like...28
Mr on angle of 3d; discocellulars not festoon-like..................32
Mr usually wanting or vestigial, rarely present; 2d and 3d not angled; discocellulars arranged in a festoon......*Napeogenes* Bates (p. 191)

28. R and Sc closely parallel to half the distance to cell apex. *Mechanitis* Fabricius (p. 181)
R and Sc separate near base..29

29. Sc sinuate, doubly curved......*Athesis* Dbld., Hew. & Westw. (p. 177)
Sc simply curved, not sinuate..30

30. R deeply convex to cell opposite cubitals..*Hypothyris* Hübner (p. 188)
R slightly if at all convex to cell opposite cubitals..................31

31. Opposite cell apex Sc separated from R by a distance shorter than 1d. *Sais* Hübner (p. 182)
Opposite cell apex Sc separated from R by a distance greater than the length of 1d........................*Xanthocleis* Boisduval (p. 181)

32. Distal branch of hum unusually long, more than twice the length of the trunk of hum......................*Hyalyris* Boisduval (p. 187)
Distal branch of hum less than twice the length of the trunk of hum...33

33. 2d twice the length of 1d; cell more than two thirds of wing length. *Hypothyris* Hübner (p. 188)
2d and 1d about the same length; cell two thirds of wing length. *Athesis* Dbld., Hew. & Westw. (p. 177)

FEMALES

1. Non-bifid hum 2
Bifid hum, both arms short.......................................10
Bifid hum, distal arm shortened to a mere lobe...................13
Bifid hum, both arms well developed..............................15

2. Mr small, arising from angled 2d; Sc shorter than the greatest width of the cell, arising near end of cell............*Scada* Kirby (p. 183)
Mr arising from angled 3d, or Sc longer than greatest width of call...3

3. 2d wanting, M_1 and M_2 stalked.............*Greta* Hemming (p. 203)
2d present, M_1 and M_2 not stalked...............................4

4. Sc and R stalked at hum, widely separated beyond their point of divergence; Mr shorter than 3d..............*Aeria* Hübner (p. 185)
Sc and R stalked at hum, widely separated beyond their point of divergence; Mr longer than 3d, on the angle of which it arises; sometimes a second short recurrent on the unangled posterior arm of 3d.....................*Eutresis* Dbld., Hew. & Westw. (p. 179)
Sc and R coalesce or run closely parallel for 5 or more mm. beyond hum...5

5. M_1 wanting, or present (one species) as an inosculating loop on R. *Heterosais* Godman & Salvin (p. 204)
M_1 present 6

6. Posterior side of cell longer than anterior side; Sc reaches margin nearly opposite cell apex....*Pseudoscada* Godman & Salvin (p. 203)
Posterior side of cell longer than anterior side; Sc reaches margin well beyond cell apex..........................*Oleria* Hübner (p. 193)
Anterior longer than posterior side of cell, or sides equal.............7

7. Sc and R separate at a point nearer apex than base of cell..........8
Sc and R separate at a point nearer base than apex of cell...........9

8. Mr longer than 3d, from the angle of which it arises, reaching into cell as far as 4d.......................*Corbulis* Boisduval (p. 195)
Mr shorter than 3d, not reaching into cell as far as 4d; R and Sc often connected at the point of separation by a short, perpendicular auxiliary vein..................*Dircenna* Dbld., Hew. & Westw. (p. 196)

9. 1d usually present; distal segment of R an arc broadly concave to M_1....................................*Oleria* Hübner (p. 193)
1d usually wanting; distal segment of R weakly curved or straight.
Episcada Godman & Salvin (p. 198)

10. Anterior side of cell longer than posterior side, or sides equal.......11
Posterior side of cell longer than anterior side.....................12

11. Sc and R separate at hum; 1d nearly perpendicular to R.
Olyras Dbld., Hew. & Westw. (p. 176)
Sc and R separate distal of hum; proximal angle of 1d with R obtuse; 1d one-half the length of 2d; Mr arises from the angle near the midpoint of 3d..........................*Placidula* d'Almeida (p. 187)
Sc and R separate distal of hum; 1d less than one-third the length of 2d; Mr from the angle of 3d, very close to M_2.
Athyrtis Felder (p. 180)

12. 1d placed as a continuation of proximal segment of R.
Elzunia Bryk (p. 176)
1d forming with R an obtuse proximal angle.
Tithorea Dbld., Hew. & Westw. (p. 175)

13. Mr arises from angle of 2d................*Callithomia* Bates (p. 194)
Mr arises from angle of 3d.....................................14

14. Sc and R connected at their point of separation (midway between base and apex of cell) by a short auxiliary vein which is sometimes vestigial; R evenly curved concave to cell; 2d much longer than 1d.
Ceratinia Hübner (p. 192)
Sc and R never connected by an auxiliary vein; R angled concave to cell; basad of the apex of this angle Sc and R nearly coalesced; 2d much longer than 1d..........*Pteronymia* Butler & Druce (p. 197)
Sc and R never connected by an auxiliary vein; R evenly curved concave to cell; 2d and 1d about the same length.
Hyposcada Godman & Salvin (p. 193)

15. Sc shorter than the greatest width of the cell, separating from R beyond the middle of the cell....................................16
Sc longer than the greatest width of cell, distinct from R from base..17

16. Sc stalked from R about half way to cell apex; Mr on angle of 2d. *Mechanitis* Fabricius (p. 181)
Sc stalked from R about half way to cell apex; 2d straight, Mr on angle of 3d or opposite M_2.............*Velamysta* Haensch (p. 184)
Sc stalked from R at apex of cell, opposite proximal end of M_2; Mr when present arising from straight 3d; 2d often incurved. *Sais* Hübner (p. 182)

17. Sc reaches costal margin with an upward hook basad of or at cell apex; Mr arises on angle of 2d..18
Sc reaches margin beyond cell apex, or lacks terminal hook.........19

18. Mr long, reaching into cell beyond anterior end of 4d. *Melinaea* Hübner (p. 178)
Mr shorter, not reaching basad as far as 4d. *Xanthocleis* Boisduval (p. 181)

19. Mr wanting, or discocellulars arranged in a festoon................20
Mr present, discocellulars never festoon-like.......................21

20. 2d and 3d on a line perpendicular to R and to 4d. *Miraleria* Haensch (p. 186)
Proximal angle between 2d and 3d about 135°, the two not perpendicular to R; 1d and R forming a proximal angle of about 60°, or 1d wanting............................*Napeogenes* Bates (p. 191)

21. R convex to cell opposite cubitals................................22
R straight opposite cubitals, or slightly concave to cell..............23

22. Distal arm of hum twice the length of its trunk. *Hyalyris* Boisduval (p. 187)
Distal arm of hum less than twice the length of its trunk. *Hypothyris* Hubner (p. 188)

23. Costal margin angled proximal of cell; hair patch present. *Thyridia* Hübner (p. 180)
Costal margin not angled proximal of cell; no hair patch...........24

24. Sc and R separate at a distance from hum clearly greater than the length of 2d 25
Sc and R separate at hum, or at a distance from it clearly less than the length of 2d...27

25. 1d present or M_1 stalked at cell; proximal end of M_3 not distal of 1d. *Ithomia* Hübner (p. 185)
1d wanting, M_1 stalked beyond the cell...........................26

26. M_3 arises much more distal than apex of cell, about as distal as origin of M_1 and terminus of Sc; posterior arm of 3d longer than 4d. *Hypoleria* Godman & Salvin (p. 199)
Mcclungia new genus (p. 201)

M_3 arises slightly more distal than apex of cell, but not as distal as origin of M_1 or terminus of Sc; posterior arm of 3d equal to or shorter than 4d........................*Godyris* Boisduval (p. 200)

27. Cell length (to apex) less than one-half wing length. *Patricia* new genus (p. 177)

Cell length more than one-half wing length. *Athesis* Doub., Hew. & Westw. (p. 177)

Tribe TITHOREINI

TITHOREA Doubleday, Hewitson & Westwood

Tithorea Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, pl. 14, fig. 1, (June 1847); pp. 99-100, (Aug. 1847). [Genotype: *Tithorea harmonia* (Cramer), by designation of Scudder, Proc. Am. Acad. Arts & Sci., x, p. 285, (1875).]

Hirsutis Haensch in Seitz, Grossschm. Erde, v, pp. 118-119, (1909). [Genotype: *Papilio harmonia* Cramer, by present designation.]

Since *Hirsutis* has lacked genotype designation, *Papilio harmonia* Cramer is herewith designated for the sake of establishing the synonymy. Haensch divided the genus into two groups according to the color of the patagia, but the venation is uniform.

The males (Fig. 54) bear two hair patches, the basal one large and brush-like, the distal one at the cell apex small and pencil-like. Sc and R branch at hum, which is bifid with both arms weakly developed. Sc is more or less doubly curved (nearly straight in some species) and reaches the margin before the apex of the wing. 1d is slightly longer than 2d, both short; the brief Mr arises from the angle of 3d, the posterior arm of which is long and curved, the anterior arm short, sometimes vestigial, making the anterior side of the closed cell shorter than the posterior side.

The females differ in that Sc reaches the margin in an up-curve and never is doubly curved; 1d is shorter than 2d; R is up-angled at 1d.

bonita Haensch†; *brunnea* Haensch; *cuparina* Bates; *duenna* Bates†, *d. monosticta* Godman & Salvin; *furia Staudinger*† (Pl. VIII, fig. 54), *f. flacilla* Godman & Salvin, *f. furina* Godman & Salvin†; *harmonia* (Cramer)†, *n. mopsa* (Fabricius)†, *n. megara* (Godart)†; *helicaon* Godman & Salvin†; *egaensis* Butler†, *e. melanina* Haensch†, *e. hermias* Godman & Salvin†, *e. neitha* Hopffer†; *hermina* Haensch†, *h. napona* Haensch; *hippothous* Godman & Salvin†; *irene* (Drury)†, *i. umbratilis* Bates†; *pinthias* Godman & Salvin†, *p. macasica* (Niepelt); *pseudethra* Butler†, *p. assimilis* Haensch†, *p. lateflava* (Haensch), *p. mira* (Neustetter), *p. pseudonyma* Staudinger†; *salvadoris* Staudinger†; *tagarma* Hewitson, *t. anachoreta* Thieme; *tarricina* Hewitson†, *t. hecalesina* C. & R. Felder†, *t. parola* Salvin†, *t. obscurata* (Haensch); *virginalis* (Köhler).

ELZUNIA Bryk

Elzunia Bryk, Parnassiana, IV, p. 20, (1937). [Genotype: *Elzunia bonplandi* (Guérin), by original designation.]

Tithorea Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, pl. 14, fig. 1, (June 1847); pp. 99-100, (Aug. 1847), (part).

When he separated *bonplandi* and allies from *harmonia* and allies, Haensch wrongly retained *Tithorea* for the present genus and placed in a new genus the genotype of *Tithorea*. Bryk noticed this while preparing the catalogue [8] and proposed *Elzunia* for the group which Haensch correctly recognized as distinct.

The hair patch of the males and the position of the veins at the apex of the cell (Fig. 12) indicate a close relationship with *Thyridia*, although the shape of the wings is quite different—in *Elzunia* broader, less elongated. *Elzunia* seems to be quite generalized.

Sc and R stalk proximal of hum, which arises on Sc and is bifid, both arms weakly developed. Sc is well separated from R and runs close to the costal margin, recalling by its position the *Pieridae*. 1d and M_1 are placed on a line with the basal segments of R, while the terminal segment of R is placed at an angle; 2d is short, straight; Mr arises from the angle of 3d, the posterior arm of which is long and curved; the anterior side of the closed cell is much shorter than the posterior side. The males bear a single hair patch.

Female venation is similar.

bonplandii (Guérin)†, *b. descandollesi* (Staudinger)†, *b. latreillei* (Staudinger)†, *b. faba* (Weymer); *cassandrina* (Srnka)†; *humboldtii* (Latreille)†, *h. albomaculata* (Haensch)†; *pavonii* (Stichel)† (Pl. V, fig. 12); *tamasea* (Hewitson), *t. lugubris* (Haensch); *regalis* (Stichel).

OLYRAS Doubleday, Hewitson & Westwood

Olyras Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, p. 107, (1847). [Genotype: *Olyras crathis* Doubleday, Hewitson & Westwood, by monotypy.]

This is a genus of a few relatively rare mountain forms with a maculation pattern similar to that found in *Eutresis* and *Athesis*.

The males (Fig. 41) bear two tufts near the costal margin of the hind wing; the proximal patch, located near the base of hum, is small and pencil-like; the distal patch is broader and brush-like and is near the cell apex. Although neither arm is well developed, hum is bifid at its extremity; it is placed perpendicular to Sc. Sc and R stalk at hum and reach the margin close together at the wing apex; Sc is doubly curved to the shape of a Cupid's bow; 1d and 2d are short and straight; Mr arises from the angle of 3d, the two arms of which are nearly the same length; the cell is closed.

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[8] Cat. Lep., pars 80, (1937).

The females differ in the following respects: Sc reaches the margin with an up-curve opposite the cell apex; 1d is wanting, M_1 and the terminal segment of R stalking at the apex of the cell.

The hind margin of the forewings in both sexes are deeply sinuate.

crathis Dbld., Hew. & Westw.†, *c. theon* Bates†; *montagui* Butler† (Pl. VII, fig. 41), *m. staudingeri* Godman & Salvin†, *m. sticheli* Haensch†; *praestans* Godman & Salvin†, *p. insignis* Salvin†; *translucens* Hewitson.

ATHESIS Doubleday, Hewitson & Westwood

Athesis Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, p. 109, (1847). [Genotype: *Athesis clearista* Dbld., Hew. & Westw., by monotypy.]

The males (Fig. 3) have a single hair patch on the hindwing, extending from hum to the apex of the cell along R. Sc and R stalk at hum, which is bifid, both arms well developed. Sc is doubly curved, shaped like a Cupid's bow, reaching the margin at the apex of the wing with an upward curve. 1d is always present, short, straight. In *clearista* 2d is the same length and straight; 3d is sharply angled, the posterior arm slightly curved; Mr is short, arising from the angle of 3d. In *arisone* Doubleday 3d is shorter and slightly curved; Mr is short, emitted from the angle of 2d.

The females differ from the males mainly by the absence of 1d, with M_1 and R stalked at the cell apex; Sc is evenly curved. The cell is closed in both sexes and is longer than half the wing length.

acrisione Doubleday† (Pl. V, fig. 3), *a. deflavata* Niepelt; *clearista* Doubleday, Hewitson & Westwood†.

The other species, *hewitsonii* Srnka and *oligyrtis* Hewitson I place with *dercyllidas* Hewitson in a new genus, *Patricia*, (see below).

PATRICIA new genus *

This includes three species, *dercyllidas* Hewitson, *Athesis hewitsonii* Srnka, and *Athesis oligyrtis* Hewitson formerly placed in *Athesis*, from which the males differ by the presence of two hair patches rather than one, and by the reduced Sc. In the females the wing is longer, narrower than in *Athesis* and the cell is proportionately shorter.

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* This genus is named for my small daughter.

The proximal hair patch of the males (Fig. 43) is small, pencil-like and is located near hum; the distal patch is located near the cell apex and is broader, brush-like. Sc and R separate at hum, which is bifid with both arms well developed. Sc is doubly curved, as in *Athesis*, but beyond the cell apex is reduced and fails to reach the margin. 1d and 2d are short, straight; 3d is angled acutely, the posterior arm S-shaped; the cell is closed. Mr is longer than 1d or 2d, arises on the angle of 3d.

In the females (Fig. 44) the apex of the cell is at a point proximal of midway between the base and wing apex (in *Athesis* the cell is two-thirds of the wing length). Sc is complete, simply curved; 1d is wanting, M_1 and R stalked at the cell apex, or 1d is minute. Other veins placed as in the male.

GENOTYPE: *Dircenna dercyllidas* Hewitson.

dercyllidas (Hewitson)† (pl. VIII, figs. 43, 44), *d. demylus* (Godman & Salvin); *hewitsonii* (Srnka); *oligyrtis* (Hewitson)†.

MELINAEA Hübner

Melinaea Hübner, Verz. b. Schmet., p. 11, (1816). [Genotype: *Melinaea egina* Cramer, by designation of Scudder, Proc. Amer. Acad. Arts & Sci., x, p. 215, (1875).]

Czakia Kremky, Ann. Zool. Mus. Pol. Hist. Nat., IV, pp. 179 and 192, (1925). [Genotype: *Czakia mediatrix* (Weymer), by monotypy.]

Unquestionably Kremky's *Czakia* is a synonym for *Melinaea*, to which *mediatrix* properly belongs. Senhor d'Almeida believes that Kremky's name was founded on a genitalic preparation from a *Tithorea* species wrongly attributed to a *mediatrix* specimen.

Melinaea can be distinguished easily from *Mechanitis* by the broader wings and especially by the fact that *Melinaea* males bear two hair patches and that *Mechanitis* females have a peculiar, short Sc. Superficially there is great similarity between species of the two genera.

The basal hair patch (Fig. 34, ♂) is small and pencil-like, the distal one broad and brush-like. Sc and R separate at or slightly proximal of hum, which is bifid. In males Sc is long, reaching the margin at the apex near the terminus of R, sometimes (*scylax* Salvin, *maenius* Hewitson) is doubly curved; in females Sc is short, terminating with an up-curve and reaching the margin at a point basal of the cell apex. In other respects the venation of the hind wing is similar in the two sexes. 1d and 3d both are short; 2d is angled, usually the anterior arm somewhat longer than the posterior arm; Mr very long, arising from the angle of 2d and extending into the cell past the distal end of 4d; the cell is closed.

agricola Hall; *comma* Forbes; *egina* (Cramer)† (Pl. VII, fig. 34), *e. paraiya* Reakirt†; *cratosthenes* Hall; *ethra* (Godart)†; *idae* (Felder)†; *lilas* (Doubleday, Hewitson & Westwood)†, *l. dodona* Hoppfer, *l. ezra* Fox†, *l. imitata* Bates†, *l. flavicans* Hoffman†, *l. erica* Barg., *l. lateapicalis* Hall, *l. limitata* Hall†, *l. messatis* (Hewitson)†, *l. parallelis* Butler†; *maëlus* (Hewitson)†, *m. cydon* Godman & Salvin†, *m. borealis* Hall†, *m. discurrens* Haensch, *m. madeira* Moulton†, *m. maconis* Hewitson†, *m. manga* Haensch, *m. purusana* Auriv., *m. zamora* Haensch; *manuelito* Tessmann; *marsaeus* (Hewitson), *m. divisa* Staudinger, *m. lucifer* Bates†, *m. orestes* Salvin†, *m. phasiana* Butler†, *m. strigilis* Weymer; *mediatrix* Weymer†, *m. mauensis* Weymer†, *m. anina* Haensch; *menophilus* (Hewitson)†, *m. brunnea* Riley, *m. cocana* Haensch†, *m. flavosignata* Staudinger†, *m. hicetas* Godman & Salvin†, *m. macaria* Godman & Salvin†, *m. messenina* Felder†, *m. zaneka* Butler†; *maenius* (Hewitson)†, *m. chincha* Drury†, *m. mothone* (Hewitson)†; *mnasias* (Hewitson); *mneme* (Linné)†, *m. satevis* (Doubleday, Hewitson & Westwood)†; *mnemopsis* Berg.†; *scylax* Salvin†.

EUTRESIS Doubleday, Hewitson & Westwood

Eutresis Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, p. 111, (1847). [Genotype: *Eutresis hypereia* Dbld., Hew. & Westw., by monotypy.]

The forms placed in this genus are superficially similar to *Olyras*, but the hind margins of the forewings are not deeply sinuate. The two genera may be readily distinguished by the hindwing venation.

In the males (Fig. 24) only one hair patch is present, which extends from hum to the apex of the cell along R. Sc and R stalk at hum, which is non-bifid. Sc is simply curved, reaching the margin near the apex of the wing. Discocellulars all present, straight; 2d and 3d about the same length, twice the length of 1d; cell closed. Mr is long, arising opposite M_2 and extending into the cell at least as far as 4d; often a second recurrent vein, small and vestigial, is placed at the middle of 3d.

The venation of the females is identical, except that 1d is minute or wanting.

hypereia Doubleday, Hewitson & Westwood† (Pl. VI. fig. 24), *h. hyspa* Godman & Salvin†, *h. imitatrix* Staudinger†, *h. theope* Godman & Salvin†; *pethoe* Gillott†.

ATHYRTIS Felder

Athyrtis C. & R. Felder, Wien. Ent. Monats., VI, p. 413, (1862). [Genotype: *Athyrtis mechanitis* Felder, by monotypy.]

To this genus only a few rather scarce forms are referrable. It resembles *Mechanitis* and *Melinaea* but the morphology is distinctive.

The males (Fig. 4) have a single hair patch extending from the base to the apex of the cell along R; Sc and R branch at hum, which is bifid, neither arm well developed; Sc reaches the margin with an upward curve at the apex of the wing; the anterior side of the closed cell is much longer than the posterior side; 1d is short, 2d is long, both straight; the well developed Mr arises from the angle of 3d, both arms of which are straight and the anterior arm short, sometimes minute.

The venation of the females is similar to that of the males, except for Sc, which runs with R for several mm. beyond hum, and which reaches the costal margin opposite the cell apex with an up-curve.

distincta Haensch; *mechanitis* Felder† (Pl. V, fig. 4), *m. amanga* Haensch†, *m. oberthuri* Srnka, *m. salvani* Srnka†, *m. similis* Tessman.

THYRIDIA Hübner

Thyridia Hübner, Verz. b. Schmet., p. 9, (1816). [Genotype: *Thyridia psidii* Cramer, by designation of Scudder, Proc. Am. Acad. Arts & Sci., X, p. 283, (1875).]

Methona Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, p. 115, (1847). [Genotype: *Thyridia themisto* Hübner, by monotypy.]

This small genus of medium sized butterflies has generalized venation which is similar in both sexes. The male fore-leg hints to reduction. Probably ancient, this genus is remarkable in that the females bear a hair patch which is entirely similar to that of the males.

The hair patch (Fig. 55, ♂) is along R extending from bifid hum half way to the apex of the cell. Sc and R stalk just beyond hum; Sc is complete, reaching the margin just above the apex of the wing. 1d is placed so that it seems to be rather a continuation of R, while the terminal segment of R angles anteriorad at the apex of the cell; 2d is the same length as 1d, while 3d is angled, the arms being of nearly equal length, emitting a short Mr; the cell is closed. Females the same.

confusa (Butler) (= *psidii* Cramer)†, *c. denigrata* Talbot, *c. psamanthe* (Godman & Salvin)†, *c. curvifascia* (Weymer); *mystica* (Zikan)†; *themisto* Hübner† (Pl. VIII, fig. 55), *t. megisto* (Felder); *singularis* Staudinger.

Tribe ITHOMIINI

XANTHOCLEIS Boisduval

Xanthocleis Boisduval, Cons. Lep. Guat., p. 30, (1870). [Genotype: *Xanthocleis aedesia* (Dbld., Hew. & Westw.), by designation of Scudder, Proc. Amer. Acad. Arts & Sci., x, p. 288, (1875).]

Aprotopos Kirby, Syn. Cat. Diurn. Lep., p. 19, (1871). [Genotype: *Thyridia aedesia* Dbld., Hew. & Westw., by designation of Kirby, Zoo. Rec., 1871, p. 359.]

The males (Fig. 57) have a single hair patch extending from base to apex of the cell along R; hum is strongly bifid; Sc and R branch at hum, Sc reaches the margin at the apex of the wing near the terminus of the down-curved R; 1d and 2d are short, straight; 3d emits from its angle a short Mr; the arms of 3d are about equal in length.

The females have a similar venation, but Sc is short, reaching the margin with an up-curve at a point opposite or proximal of the cell apex.

aedesia (Dbld., Hew. & Westw.)†; *ceto* (Felder); *melantho* (Bates)†, *m. randolis* (Haensch)†; *hippodamia* (Fabricius)†, *h. pallida* (Godman & Salvin)†; *psidii* (Linné)† (Pl. VIII, fig. 57), *p. ino* (Felder)†; *simplicior* (Röber).

MECHANITIS Fabricius

Mechanitis Fabricius, Mag. f. Insektenk. (Illiger), vi, p. 284, (1807). [Genotype: *Mechanitis polymnia* (Linné), by designation of Scudder, Proc. Am. Acad. Arts & Sci., x, p. 212, (1875).]

Nereis Hübner, Exot. Schmett., i, pl. 1, fig. 2, 5-8 etc., (1806), (preoccupied Linné 1758). [Genotype: *Nereis polymnia* (Linné), by designation of Scudder, Proc. Am. Acad. Arts & Sci., x, p. 227, (1875).]

Hymenitis Anonymous (not Hubner 1816), Allgem. Lit. Zeitg. Halle (Jena), ii, p. 1180, (Dec. 19, 1807). [Genotype: *Papilio polymnia* Linné, by designation of Hemming, Gen. Nam. Hol. Butt., i, p. 27, (1934).]

Epimetes Billberg, Enum. Ins., p. 77, (1820). [Genotype: *Papilio polymnia* Linné, by designation of Hemming, Entomologist, lxvi, p. 199, (1933).]

The numerous and frequently common species in this genus exhibit maculations which all are variations on the general pattern theme termed by Haensch in Seitz (1909) the "Lycorea-habitus" and are closely similar to *Melinaea* as a whole, and to random species in various genera; venation serves to separate specimens properly.

On the hind wings the males (Fig. 35) have a single hair patch extending from the base to the apex of the cell along R. The hum is strongly bifid; Sc branches from R near hum, but runs closely parallel to R as far as one-third to one-half the distance to the cell apex; 1d and 3d are straight; Mr arises from the angle of 2d and is short; the anterior arm of 2d tends to be longer than the posterior arm; the cell is closed.

In the females (Fig. 36), Sc is completely coalesced with R at least as far as the midpoint between the base and the cell apex; after stalking from R, Sc runs steeply to the costal margin and never is as long as the greatest width of the cell. Although 1d usually is present, sometimes it is vestigial or wanting; rarely R and M_1 branch beyond the cell apex. In other respects the female venation is like that of the male.

Forbes[9] pointed out that *Scada* and *Sais* should be associated with *Mechanitis*. These three genera share many important characters, but perhaps their relationship is emphasized most dramatically by the unique Sc of the female hind wing.

doryssus Bates†, *d. labotas* Distant†, *d. saturata* Godman & Salvin†, *d. utemaia* Reakirt†, *d. veritabilis* Butler†; *doryssides* Staudinger†, *d. eurydice* Haensch†, *d. argentea* Prüffer; *egaënsis* Bates†, *e. obscura* Butler, *e. plagigera* Butler†, *e. contracta* Riley, *e. septentrionalis* Apolinar; *elisa* (Guérin)†, *e. menecles* Hewitson†, *e. ocona* Drury†, *e. connectens* Coll. & Talb.; *equicola* (Cramer), *e. equicoloides* Godman & Salvin†, *e. sylvanoides* Godman & Salvin; *isthmia* Bates†, *i. lycidice* Bates†, *i. arcana* Haensch†, *i. ovata* Distant; *limnea* Forbes†; *lysimnia* (Fabricius)†, *l. albescens* Haensch†, *l. sulphurescens* Haensch; *macrinus* Hewitson†; *mantineus* Hewitson†; *menapis* Hewitson†, *m. franis* Reakirt†; *mazaeus* Hewitson, *m. deceptus* Butler†, *m. fallax* Butler†, *m. meterus* Hewitson, *m. messenoides* Felder†, *m. nigroapicalis* Felder†, *m. jurimagnensis* Staudinger, *m. lucifera* Haensch, *m. phasianita* Haensch†, *m. pannifera* Butler†, *m. nessaea* (Hübner); *olivencia* Bates†, *o. hullaga* Staudinger†, *o. juntana* Haensch†, *o. truncata* Butler†; *polymnia* (Linné)†, *p. angustifascia* Talbot, *p. casabranca* Haensch†, *p. caucaënsis* Haensch†, *p. chimborazona* Bates†; *proceris* Weymer†; *visenda* Butler, *v. elevata* Riley.

SAIS Hübner

Sais Hübner, Verz. b. Schmet., p. 10, (1816). [Genotype: *Sais rosalia* (Cramer), by designation of Bates, Trans. Linn. Soc. London, 1862, p. 52.]

The males (Fig. 53) bear a hair patch located along R from hum to two-thirds of the distance of the cell apex. Sc and R stalk at the strongly bifid hum, but run in parallel courses close together to the margin; 1d is straight, perpendicular to R; 2d is weakly angled and bears a short Mr; 3d is straight. In both males and females Mr occasionally is found on the straight 3d, although 2d remains angled.

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[9] Jour. N. Y. Ent. Soc., xxxii, pp. 146, 147, (1924).

The most important venation difference in the female (Fig. 52) is that R and Sc completely coalesce nearly to the cell apex. Usually the segment of R between Sc and 1d is shorter than 2d. Beyond its separation from R, Sc angles steeply to the margin and is shorter than the greatest width of the cell.

rosalia (Cramer)†, *r. badia* Haensch†, *r. camariensis* Haensch† (Pl. VIII, figs. 52, 53), *r. mosella* (Hewitson)†, *r. paraënsis* Haensch†, *r. virchowii* Dewitz†; *klagesi* Avinoff†; *zitella* (Hewitson)†, *z. promissa* Weymer†.

SCADA Kirby

Scada Kirby, Syn. Cat. Diurn. Lep., p. 23, (1871). [Genotype: *Oleria theaphia* Bates, by designation of Kirby, Zool. Rec., 1871, p. 359.]

Heteroscada Schatz, Fam. Gatt. Tagfalt., pp. 87, 89, 91, pl. 11, (1886). [Genotype: *Heteroscada gazoria* (Godart), by designation of Bryk, Lep. Cat., pars 80, p. 525, (1937), (=*Papilio karschina* Herbst).]

Salacia Hübner, Zutr. Exot. Schmet., II, p. 25, fig. 339, 340, (1823), (preoccupied Lamouroux, 1816). [Genotype: *Salacia phyllodoce* Hübner, by monotypy.]

In the Zoological Record for 1871 Kirby designated *theaphia* genotype for his genus *Scada*; this reference, heretofore overlooked, invalidates Scudder's designation[10] of *phyllodoce*, but does not affect the usage of the name, as the two species are congeneric. Godart's *gazoria* was shown by d'Almeida[11] to be synonymous with *phyllodoce*, thus sinking the Schatz generic name.[12]

The males (Fig. 47) bear a single hair patch which does not extend distally to the apex of the cell. Sc separates from R at hum, which is simple and unbranched, and runs close to R to the margin, which it reaches well beyond the cell apex. In the females, Sc is completely merged with R at least as far as two thirds of the distance to the cell apex; after stalking from R, Sc runs steeply to the costal margin and never is as long as the greatest width of the cell. In this character and in the position of Mr, the venation of *Scada* resembles *Mechanitis*. Mr is short or vestigial and is placed on the angle of 2d, the arms of which are nearly the same length; 3d is short, the cell is closed.

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[10] Proc. Am. Acad. Arts & Sci., x, p. 226, (1875).

[11] Lambillionea, 1939, p. 78.

[12] In the same paper d'Almeida pointed out that the only other species referred to *Heteroscada*, *fenella* Hewitson, belongs in *Hypothyris*. Having examined a female of "*fenella*" in the American Museum collection, I am able to verify this. In his *Mechanitis* paper Forbes (Jour. N. Y. Ent. Soc., XXXII, p. 147, (1924)) said "*Heteroscada* is synonymous with *Scada*, being based on males of *Scada* and females of *Episcada*."

In the females (Fig. 48) 1d is always present, usually about the same length as 3d; but in *zibia* Hewitson 1d is much longer than either 2d or 3d, and forms with the terminal segment of R a Y-shaped fork of radius, the apical angle of which is not much greater than 15°.

ethica (Hewitson)†, *e. quotidiana* Haensch†, *e. excellens* (Srnka), *e. kusa* (Hewitson)†; *ortygia* (Druce)†; *philemon* (Felder); *karschina* (Herbst)† [=*gazoria* Godart†; =*phyllodyce* Hübner†]; *reckia* (Hübner)†, *r. delicata* Talbot *theaphia* (Bates)†, *t. batesi* Haensch†, *t. majuscula* Haensch; *zemira* (Hewitson)†; *zibia* (Hewitson) (Pl. VIII, figs. 47, 48), *z. amplificata* Haensch†, *z. xanthina* (Bates)†.

VELAMYSTA Haensch

Velamysta Haensch, in Seitz, Grossschm. Erde, v, p. 158, (1909). [Genotype: *Ithomia cruxifera* Hewitson, by designation of Bryk, Cat. Lep., pars 80, p. 613, (1937).]

This is a genus of very scarce forms whose phylogenetic position is rather problematic. The females offer the best clues as to relationship, and on the basis of the *Mechanitis*-like Sc of the hindwing, and of the four-jointed fore tarsus, I am assigning the genus a place in the *Mechanitis* series. However, since *Velamysta* is so specialized and so developed from whatever its true antecedents might have been, it may be possible that this genus should be placed elsewhere on the theory that the female Sc and fore tarsus evolved independently. The angle of Sc and the swollen veins at the cell apex in the males make a formation unique among the *Ithomiinae* and not to be confused with any other genus.

The males (Fig. 56) bear two hair patches, a smaller proximal one near the base of R, a larger one at the cell apex; hum is strongly bifid; Sc and R run closely parallel for a distance, then separate gradually. Opposite the cell apex, Sc is angled and swollen, then diminishes in size as it reaches the margin near the wing apex. Paralleling the swelling of Sc, R and 1d also are swollen. The terminal segment of R is strongly angled and with Sc forms an open, somewhat rectangular cell-like space. 2d is straight; 3d is angled at its anterior end and emits a short Mr; 1d and 2d form an angle less than 90°.

In the females Sc is coalesced with R to at least half way to the cell apex, and is shorter than the greatest width of the cell; 1d is wanting, with M_1 stalked with R several mm. beyond the cell apex; 2d is straight, short; 3d is angled near its anterior end, where it emits a brief Mr, and the posterior arm of 3d is faintly S-shaped; M_2 at its proximal end is strongly curved.

anomala (Staudinger)†; *breyeri* Kohler; *cruxifera* (Hewitson)†; *pupilla* (Hewitson)†, *p. dispersa* (Weymer); *pardalis* (Salvin)†, *p. totumbra* Kaye; *peninna* (Hewitson)† (Pl. VIII, fig. 56), *torquatilla* (Hewitson).

AERIA Hübner

Aeria Hübner, Verz. b. Schmet., p. 9, (1816). [Genotype: *Aeria aegle* Hübner, by designation of Scudder, Proc. Amer. Acad. Arts & Sci., x, p. 103, (1875).]

This is a genus of small delicate forms which resemble in color and pattern the species belonging to *Scada*. With that genus *Aeria* shares the peculiar foreleg reduction in the male in which the femur is shorter than the coxa.

The males (Fig. 1) bear a hair patch along R from hum to the cell apex, sometimes along 1d as well; hum is non-bifid; Sc in both sexes separates from R just distal of hum, and in the males reaches the margin well beyond the cell apex, in the females (Fig. 2) just beyond the cell apex. 1d is present in some specimens, wanting in others; sometimes R and M_1 are stalked beyond the cell; 2d mostly is short and straight, but sometimes longer and angled, then emitting the brief Mr. Mostly Mr arises from the angle of 3d; 3d is straight when 2d is angled; as a rule Sc of the males is separated from R opposite the cell apex by a distance which is greater than the length of the shortest discocellular vein present; also the angle formed by 3d and 4d is acute. These two characters serve to separate this genus from *Scada*, with which some specimens might be confused. In the latter genus, the distance between Sc and R opposite the cell apex is shorter than the length of the shortest discocellular present, while the angle formed by 3d with 4d is obtuse.

clara (Hewitson), *c. clarina* (Oberthur); *clodina* Staudinger†; *eurimedia* (Cramer)†, *e. agna* (Dbld., Hew. & Westw.)† (Pl. V, figs. 1, 2), *e. pacifica* Godman & Salvin,†, *e. palmara* Haensch†; *olena* Weymer†.

ITHOMIA Hübner

Ithomia Hubner, Verz. b. Schmet., p. 9, (1816). [Genotype: *Ithomia drymo* Hübner, by designation of Butler & Druce, Cist. Ent., i, p. 95, (1872).]

Pagyris Boisduval, Cons. Lep. Guat., p. 34, (1870). [Genotype: *Pagyris ulla* (Hewitson), by monotypy.]

This is a large genus distributed throughout the continental American tropics; nearly every lot of tropical butterflies contains some examples. Many of the species are quite common.

The characteristic hair patch of the males (Fig. 31) in *Ithomia* is unique and serves to identify the genus. It is situated midway between hum and the cell apex; Sc and R completely coalesce as far as the patch, where Sc curves anterior, R posterior, to detour around an oval area which is distinctly raised ventrad; the distal end of this oval is closed by a short auxiliary vein connecting Sc and R. *Ithomia* is the only genus having such an oval hair patch raised beneath and completely enclosed by veins. Beyond the patch Sc is separate from R and reaches the margin beyond the cell apex; hum is bifid, the distal arm being long and well developed; 1d is short, normally present; 2d is somewhat curved convex to the cell; 3d is angled, bearing a short Mr, or deeply curved with Mr wanting. In *hyala* Hewitson the tendency for Sc to coalesce with R is developed to the point that the two veins are merged distal as well as proximal of the hair patch, Sc being separate only where it encloses the anterior part of the patch.

In the females (Fig. 32) Sc separates from R at hum, but runs closely parallel as far as a point opposite Cu_2, beyond which it curves away; as Sc nears the wing apex, it recurves toward R and reaches the margin quite near it; 1d is wanting as often as it is present; 2d and 3d are straight when they do not emit the short Mr, which may be located on either discocellular, or opposite M_2; when Mr arises from a discocellular, that vein is angled.

aelia Hewitson†; *agnosia* Hewitson† (Pl. VII, figs. 31, 32); *amarilla* Haensch; *aquinia* Hopf.; *ardea* Hewitson†; *avella* Hewitson†, *a. ellara* Hewitson†, *a. eleonora* Haensch†, *a. beata* Haensch; *bolivari* Schaus†; *celemia* Hewitson†, *c. candescens* Haensch†, *c. lurida* Haensch†, *c. splendens* Haensch; *cleora* Hewitson†; *diasia* Hewitson†; *drogheda* Weeks; *drymo* Hübner†, *d. napho* Her.-Schf.†, *d. pellucida* Weymer†; *epona* Hewitson†; *hamlini* Weeks†; *heraldica* Bates†, *h. plaginota* Butler & Druce†; *hippocrenis* Bates†, *h. morena* Haensch†; *hyala* Hewitson†; *galata* Hewitson†, *g. jucunda* Godman & Salvin†; *lagusa* Hewitson†, *l. hymettia* Staudinger†; *iphianassa* Doubleday, Hewitson & Westwood†, [= *lycaste* (Reakirt) (not Fabricius)]†, *i. anaphissa* Herrich-Schaeffer†, *i. panamensis* Bates†, *i. boucardi* (Druce)†, *i. pumensis* (Reakirt); *mira* Staudinger; *nigromargo* Butler; *oenanthe* Weymer†; *ossuna* Haensch†; *patilla* Hewitson†; *p. leila* Hewitson†; *peruana* Salvin; *phanessa* Herrich-Schaeffer†, *p. alienassa* Haensch†; *pseudoagalla* Rebel†; *salapia* Hewitson†, *s. derasa* Hewitson†, *s. travella* Haensch†; *salcata* Schaus†;*sarcinarius* Weeks; *terra* Hewitson†, *t. terrana* Haensch†, *t. vulcana* Haensch†; *theuda* Hewitson†, *t. linda* Hewitson†; *ulla* Hewitson, *u. dimidiata* Staudinger; *neglecta* Müller; *xenos* (Bates)†; *lichyi* d'Almeida†.

MIRALERIA Haensch

Miraleria Haensch, Berlin Ent. Zeit., XLVIII, pp. 211-212, (1903). [Genotype: *Miraleria cymothoë* (Hewitson), by original designation.]

The hair patch of the males is oval, raised ventrad as in *Ithomia*, but its distal end is open, there being no auxiliary vein at the end of the patch (fig. 33); hum is bifid, but the distal arm is not as strongly developed as in *Ithomia;* Sc and R run side by side, nearly coalesced, as far as the patch, around which they arch; beyond the patch Sc runs to the margin which it reaches with a slight upward bend. In the females (Fig. 42) Sc runs closely parallel to R for a short distance, then separates evenly from it and reaches the margin a little distal of the cell apex. The discocellulars are similar in both sexes: 1d is short, always present, set at an angle of about 135° with R; 2d and 3d are on a line perpendicular to the costal margin, are straight or somewhat S-shaped; sometimes a vestigial Rc, a slight swelling, is to be found on either or both 2d and 3d.

cymathoë (Hewitson)† [= *flavomaculata* Haensch†]; *sylvella* (Hewitson)† (Pl. VII, figs. 33, 42), *s. ornata* Haensch†.

PLACIDULA d'Almeida

Placidula d'Almeida, Mel. Lep., p. 67 (1922). [Genotype: *Placidula euryanassa* (Felder), by original designation.]

Of numerous generic names proposed for separation from the rather composite genus *Hypothyris* as used by Bryk (*Ceratinia* of authors) d'Almeida's *Placidula* is most evidently separate. *P. euryanassa* stands alone and unique, without any closely related form so far discovered.

The hair patch of the males (Fig. 49) is located along R from hum to a point about two-thirds of the distance to the cell apex; hum is bifid, but weakly so, both arms being very brief; Sc and R run together closely for several mm. beyond hum before they separate; Sc usually is complete, though in one specimen in the Academy collection, it just fails to reach the margin; 1d is long, usually longer than 2d, and the angle it forms with R is obtuse toward the cell; both 1d and 2d are straight; Mr is straight, arises from the bluntly angled 3d; the point between 1d and 2d is the most distal part of the cell; M_1 is slightly concave to M_2; the cell is closed.

In the females hum is similar and offers an important distinguishing character. Likewise, Sc and R run parallel for a short distance beyond hum before separating. Sc reaches the margin with an upward curve just distal of the cell apex; 1d is placed as in the male; 2d is straight, but more nearly perpendicular to R than in the male; 3d is angled and emits a brief Mr.

euryanassa (Felder)†, (Pl. VIII, fig. 49).

HYALYRIS Boisduval

Hyalyris Boisduval, Cons. Lep. Guat., p. 33 (1870). [Genotype: *Hyalyris coeno* (Dbld., Hew. & Westw.), by monotypy.]

Oregenes Stichel, Berlin Ent. Z., XLIV, pp. 321-2, (1899). [Genotype: *Napeogenes excelsa* (Felder), by original designation.]

Hyalyris as resurrected by Bryk in the Catalogus Lepidopterorum (1937) included species properly associated with *ninonia* in *Hypothyris*, not with *coeno*. A revised concept of *Hyalyris* is introduced here and is founded largely on the unique construction of the humeral vein.

The males (Fig. 15) bear a hair patch extending from hum to half the distance to the cell apex; hum is bifid, the distal arm unusually long, more than twice the length of the unbranched trunk of hum; Sc and R separate at hum but run to the margin parallel to each other; 1d is short, perpendicular to R; M_1 is concave to R or straight; 2d and 3d are long; 2d is somewhat convex to the cell. The angle of 3d, sometimes located at the extreme end of the vein, emits the Mr; the posterior arm is concave to the closed cell.

In both sexes the hind wings are unusually broad, the apices rather blunt.

In the females (Fig. 16) Sc separates from R just beyond the bifid hum, beyond which the distance between them increases evenly as far as the cell apex, where Sc recurves and reaches the margin near R. R is only slightly convex to the cell; 1d usually is wanting, with M_1 stalked at the cell apex; when present 1d is short, perpendicular to R; 2d and 3d are of equal length; 2d is in-angled and emits a longish Mr; 3d is obtusely out-angled.

coeno (Dbld., Hew. & Westw.)† (Pl. VI, figs. 15-16), *c. latalimbata* (Weymer)†; *excelsa* (Felder)†, *e. decumana* (Godman & Salvin)†; *lurida* (Butler)†, *l. tricolor* (Salvin)†; *norella* (Hew.)†, *n. nora* (Haensch)†; *ocna* (Herrich-Schaeffer)†; *statilla* (Hew.)†, *s. atagalpa* (Haensch)†.

HYPOTHYRIS Hübner

Hypothyris Hübner, Index, p. 5, (1821). [Genotype: *Hypothyris ninonia* (Hübner), by monotypy.]

Tritonia Geyer in Hübner, Zutrage Exot. Schmet., IV, p. 25, (1832), (preoccupied Cuvier, 1792). [Genotype: *Tritonia eupompe* Geyer, by monotypy.]

Ceratinia Dbld., Hew. & Westw. (not Hübner, 1816), Gen. Diurn. Lep., I, p. 127, (1847).

Dynothea Reakirt, Proc. Ent. Soc. Philad., V, p. 222, (1865). [Genotype: *Dynothea lycaste* (Fabricius), by designation of Scudder, Proc. Amer. Acad. Arts & Sci., X, p. 34, (1875).

Epityches d'Almeida, Brasil Medico, LII, p. 112, (1938). [Genotype: *Tritonia eupompe* Geyer, by original designation.]

Rhodussa d'Almeida, Rev. Ent. Brasil, X, p. 278, (1939). [Genotype: *Ceratinia pamina* Haensch, by original description.]

There is no predicting color and pattern among the *Ithomiinae.* Superficially *eupompe* shows little similarity with *ninonia*; in venation, however, careful examination reveals not only certain differences, but also many fundamental similarities. Were genera based on genotypes only, *Epityches* would survive, but so many intergrades in venation are available that I am forced to recognize the two names as belonging to the same genus.

At first I was inclined to accept *Rhodussa* as a good genus, but when I recently examined females of *pamina* in the Cornell collection, I realized that this was only a slight variant of the normal *Hypothyris* venation; the females are not unusual. Then I compared again the genitalia, and now feel justified in placing *Rhodussa* in the synonymy.

Should Hübner's Index be given the same fate as the unlamented Tentamen, *Hypothyris* would be available under the next date of publication, which, as far as I can discover, is Scudder, 1875, and would fall as a synonym to Reakirt's *Dynothea.*[13] The insect determined by Reakirt as *lycaste* of Fabricius and upon which he erected *Dynothea* really was *Ithomia iphianassa panamensis* Bates.[14] If Hemming's recommendation is to be followed,[15] *Dynothea* is a synonym for *Ithomia.* However, if it becomes the practice to associate a generic name with the true identification where the author of a genus founds his name on a misidentification, what is to be done where the author of a generic name founds his genus on a heterogeneous series? Not only does it seem simpler, then, to associate a generic name with the insect which the author thought he had, but it seems to be the only practice which logically can avoid confusion.

The retention of *Ceratinia* to apply to this genus according to the mistaken usage perpetrated by Schatz and Haensch, would require the bulky mechanics of a " conservanda " ruling by the Commission. *Ceratinia* has been used in literature to denote

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[13] See d'Almeida, Rev. Ent. Brasil, x, p. 278, footnote (1939). However, the Index is published until a contrary ruling is obtained.

[14] Fox, Ent. News, L, pp. 141-144 (1939).

[15] Hemming, Gen. Nam. Holo. Butt., p. 10, (1934) on " Genera in which the type is a species misidentified by the original author."

Papilio nise Cr. and allies by Hübner, Doubleday, Hewitson, Bates, Kirby, Scudder and Bryk. The alternative is for workers to ignore *Hypothyris* as well as Scudder's genotype designation for *Ceratinia*. This latter alternative denotes chaos, since it opens the door to workers of every sort to ignore names that do not happen to strike their fancies, and to preserve names for which they might have sentimental attachment.

The males (Fig. 21) bear a hair patch along R from hum to a point two thirds of the distance to the cell apex; hum is bifid, the arms long and well developed; Sc and R branch at hum; R is strongly convex to the cell opposite the cubitals, complete, the terminal segment curved downward, usually reaching the margin somewhat above the wing apex. Sc, beyond its separation from R usually is sinuate, its course not uniformly parallel to that of R, and reaches the margin quite near to R; 1d is always present, short, rather perpendicular to R; M_1 is more or less concave to R; 2d usually is gently in-curved, longer than 1d; rarely (*pamina* for example) 2d is angled and emits Mr. Usually 3d is angled, emitting Mr, which varies in length but generally is rather long; posterior arm of 3d curved, mostly strongly so, away from the closed cell; anterior arm one third the length of the posterior arm, sometimes much shorter; when 2d is angled, 3d as a whole is curved away from the cell. The line formed by 2d and 3d points in the general direction of the terminus of Sc in most typical species.

The females (Fig. 22) exhibit many variations in venation, especially at the distal end of the cell. Sc and R separate at hum, as in the male; Sc curves away from R, then runs to the margin which it reaches well beyond the cell apex, usually but not always well distant from R. In the majority of examples 1d is wanting, with M_1 branching several mm. beyond the cell apex; but many specimens have a short, perpendicular 1d; this variation is not specific and may be found in any long series of females of a given species. The line formed by 2d and 3d varies in its direction, in *ninonia* nearly perpendicular to R, in *eupompe* its proximal angle with R is about 45°; various angles between these extremes are to be found. 2d is straight or slightly convex to the cell, in a few individual cases obtusely angled, giving rise to Mr; sometimes Mr arises opposite M_2; mostly it arises from 3d which then is angled, the posterior arm usually strongly concave to the cell, infrequently nearly straight. When Mr does not arise from 3d, the latter always is bent concave to the cell.

anastasia (Bates)†, *a. anastasina* (Staud.)†; *angelina* (Haensch)†; *antea* (Hew.)†; *antonia* (Hew.)†; *appolinis* (Staud.)†; *cana* (Haensch)†; *cantobrica* (Hew.)†; *catilla* (Hew.)†; *daeta* (Boisduval)†, *d. vallonia* (Hew.)†; *dionaea* (Hew.)†; *eupompe* (Geyer)†; *fenestella* (Hew.)†, *f. intermedia* (Butler)†, *f. peruviana* (Staud.)†, *f. valora* (Haensch)†; *fimbra* (Hew.)†; *fluonia* (Hew.)†; *frater* (Salvin)†; *fulminens* (Butler)†, *f. satura* (Haensch)†;

herbita (Weymer)†, *h. viola* (Haensch)†; *honesta* (Weymer)†; *ignorata* (Haensch)†; *lepieurii* (Feisthamel)†; *leucania* (Bates)†, *l. cleis* (Bates)†, *l. callispila* (Bates)†, *l. mylassa* (Druce)†; *maenas* (Haensch)†; *mansuetus* (Hew.)†, *m. moebiusi* (Haensch)†; *lycaste* (Fab.)†, *l. mergelena* (Hew.)†; *mutilla* (Hew)†, *m. pellucida* (Haensch)†; *nina* (Haensch), *n. callanga* (Haensch)†; *ninonia* (Hübner)† (Pl. VI, figs. 21, 22), *n. barii* (Bates)†, *n. completa* (Haensch)†, *n. euclea* (Godart)†, *n. latefasciata* (Haensch)†; *oulita* (Hewitson)†, *o. metella* (Hopffer)†; *pamina* (Haensch)†; *pardalina* (Hopffer)†, *p. pantherina* (Staud.)†; *philetaera* (Hew.)†; *porsenna* (Srnka)†; *pyrippe* (Hopffer)†, *p. tenna* (Haensch)†, *p. napona* (Haensch)†, *p. calva* (Haensch)†; *rowena* (Hew.)†, *r. occulata* (Haensch)†; *thea* (Hew.)†; *tigrina* (Druce)†.

NAPEOGENES Bates

Napeogenes Bates, Trans. Linn. Soc. London, XXIII, p. 533, (1862). [Genotype: *Napeogenes cyrianassa* (Dbld., Hew. & Westw.), by designation of Scudder, Proc. Amer. Acad. Arts & Sci., x, p. 224, (1875).]

Chordis Boisduval, Cons. Lep. Guat., p. 33, (1870). [Genotype: *Chordis peridia* (Hew.), by monotypy.]

Ceratonia Boisduval, Cons. Lep. Guat., p. 32, (1870), (preoccupied Costa, 1839). [Genotype: *Ithomia stella* Hew., by designation of Kirby, Zool. Rec., 1870, p. 383.]

Garsauritis d'Almeida, Brasil Medico, LII, p. 112, (1938). [Genotype: *Ceratinia xanthostola* Bates, by original designation.]

It is possible that *Garsauritis* might be used for a subgenus, for in *xanthostola* several minor differences from typical *Napeogenes* can be discovered, for example, the developed recurrent and the shortened M_2; the female is rather typical of *Napeogenes*, however.

The venation of the hindwings in this genus is characteristic and readily recognizable by the festoon-like arrangement of the discocellulars.

The males (Fig. 37) bear a long hair patch extending from hum to 1d along R; Sc and R stalk at the strongly bifid hum; R is convex to the cell opposite the cubitals; Sc is distinctly separate from R beyond their stalking and reaches the margin at the wing apex. The anterior side of the cell is very long, extending nearly to the margin so that the terminal segment of R is shorter than the greatest width of the cell; 1d is perpendicular to R; 2d and 3d are not angled, often gently curved, and form with the cubitals segments a characteristic festoon; Mr is wanting in most species; sometimes there is a vestigial Mr, little more than a swelling of 3d, often found on the wing of one side and not on the other; in a very few species Mr is always present.

The venation of the females (Fig. 38) differs in several respects: Sc is somewhat more separate from R distal of their stalking, and reaches the margin with an upward curve; the anterior side of the cell is proportionately shorter than in the males, being about two-thirds of the wing length. The proximal portion of R is not so deeply convex to the cell and sometimes is nearly straight; 1d is sometimes present and short, often wanting, in which case R and M_1 may be stalked beyond the cell apex. The festoon arrangement of the discocellulars is found also in females, but proportionately compressed and made steeper by the shorter female cell.

apulia (Hewitson)†; *corena* (Hewitson)†; *cranto* Felder†, *c. paedaretus* Godman & Salvin†; *cyrianessa* (Dbld., Hew. & Westw.)†, *c. adulta* Haensch†, *c. dilutata* Haensch†; *duessa* (Hew.)†; *flossina* Butler†, *f. hypsaea* Staud.†; *glycera* Godman†; *hemisticta* Schaus†; *inachia* (Hewitson)†, *i. adelpha* Bates†, *i. moles* Haensch†; *larilla* (Hew.)†; *peridia* (Hew.)†, *p. hemimelaena* Godman & Salvin†; *pharo* (Felder)†, *p. avila* Haensch†; *stella* (Hew.)†, *s. aster* Gorman† (Pl. VII, figs. 37, 38); *tolosa* (Hew.)†, *t. amara* Godman†; *verticilla* (Hew.)†; *xanthone* Bates†, *x. richardi* Fruhst.†; *xanthostola* (Bates)†, *x. desmora* (Haensch)†.

Tribe OLERIINI

CERATINIA Hübner

Ceratinia Hübner, Verz. b. Schmett., p. 10, (1816). [Genotype: *Ceratinia neso* (Hübner), by designation of Scudder, Proc. Amer. Acad. Arts & Sci., x, p. 138, (1875), (=*Papilio nise* Cramer 1782).]

Calloleria Godman & Salvin, Biol. Cent. Am., Rhop. I, pp. 33-34, (1879). [Genotype: *Ithomia tutia* Hewitson, by original designation.]

Epileria Rebel, Weymer & Stichel, Berl. Ent. Zeit., XLVI, pp. 292-3, (1901). [Genotype: *Ithomia singularis* Rebel, by monotypy.]

The males (Fig. 7) have a single hair patch extending from the base to the apex of the cell along R; hum is bifid, the distal arm not well developed; Sc and R run closely parallel to about half the distance to the cell apex, then separate gradually; Sc reaches the margin at the apex with an up-curve. In two specimens of *cayana* Salvin in the Academy's collection the terminal segment of R is angled upward and merges with Sc just away from the margin. 1d usually is present, although it may be wanting, in which case M_1 and R stalk beyond the apex of the cell; 2d is gently curved convex to the cell; a short Mr arises from the angle of 3d, the posterior arm of which is concave to the cell.

The females (Fig. 8) are similar except Sc, which often is connected with R at their point of separation by a short auxiliary vein, a character also found in *Dircenna*.

cayana (Salvin)†; *doto* (Hübner)†; *hopfferi* (Weymer)†, *h. onoma* (Haensch); *iolaia* (Hewitson)†, *i. conveniens* (Haensch)†; *melanoptera* (Hewitson); *nise* (Cramer)†, (Pl. V, fig. 8, ♀), *n. espriella* (Hewitson)†, *n. peruensis* (Haensch)†, *n. terapotis* (Haensch)†, *n. tucumana* (Köhler); *poecila* (Bates)†, *p. poecilana* (Haensch)†, *p. callichroma* (Staudinger), *p. azarina* (Weymer), *p. nigronascens* (Haensch); *porrecta* (Haensch); *radiosa* (Haensch); *robusta* (Haensch); *selenides* (Weymer)†; *singularis* (Rebel)†; *tutia* (Hewitson)†, (Pl. V, fig. 7, ♂), *t. azara* (Hewitson)†, *t. chanchamaya* (Haensch)†, *t. dorilla* (Bates)†, *t. tosca* (Schaus)†.

HYPOSCADA Godman & Salvin

Hyposcada Godman & Salvin, Biol. Cent. Amer., Rhop. I, p. 35, (1879). [Genotype: *Ithomia adelphina* Bates, by original designation.]

The males (Fig. 19) bear a hair patch along R from base to cell apex; Sc separates from R at hum, which is bifid, and reaches the margin at the wing apex with an upward curve. In the females (Fig. 20) this terminal curve is wanting on Sc, which is evenly arched. In other respects the venation is similar in both sexes. 1d and 2d are short, same length, the proximal angle formed by them about 135°. A well developed Mr arises from the acute angle of 3d, the posterior arm of which is concave to the closed cell.

abida (Hew.)†; *aesion* (Godman & Salvin)†; *anchiala* (Hewitson)†; *consobrina* (Godman & Salvin)†; *fallax* (Staud.)†; *illinissa*†; *kezia* (Hew.)†, *k. rezia* Haensch†; *sinilia* (Herrich-Schaeffer)†; *virginiana* (Hew.)†, *v. evanides*†, (Pl. VI, figs. 19, 20).

I suspect that many of the species referred to *Leucothyris* in the past should be placed in this genus, but lacking complete material I have not attempted a shift. The key difference between *Hyposcada* and *Oleria* is to be found in the humeral vein of the hind wings.

OLERIA Hübner

Oleria Hübner, Verz. b. Schmet., p. 9, (1816). [Genotype: *Oleria astraea* (Dbld., Hew. & Westw.), by designation of Scudder, Proc. Amer. Acad. Arts & Sci., x, p. 232, (1875), (=*Papilio astrea* Cramer 1779).]

Leucothyris Boisduval, Cons. Lep. Guat., p. 32, (1870). [Genotype: *Leucothyris ilerdina* (Hewitson), by monotypy.]

It is regrettable, perhaps, that the familiar Boisduval name for this large genus must be sunk before the little known Hübner name, but there seems no point to perpetrating a usage contrary to priority.

The males (Fig. 39) bear a patch of long hairs arranged in a thin brush arising near the base of the wing above R; hum is non-bifid; Sc and R run side by side for a short distance beyond hum and never are the two veins much separated. The short 1d is close to the margin, so that the distal segment of R is shorter than the width of the cell; 2d is long, tends to approximate being parallel to R; 3d is long, acutely angled, gives rise to the short Mr; the posterior arm of 3d is concave to the closed cell; the general shape of the cell is like a fist with index finger pointing toward the wing apex; the anterior side of the cell often reaches nearly to the margin. But in a small group of less characteristic species the cell is shorter, 1d being only a little distad of 2d, which is shorter; between these and the numerous long-celled forms there are many intergrades. It is possible that most of these short-celled forms should be referred to *Hyposcada.*

The females (Fig. 40) have a much shorter cell than the males, with 2d and 1d the same length; in other respects the sexes are alike in venation.

aegle (Fab.)†, *a. zarepha* (Hew.)†; *agarista* (Felder)†, *a. janarilla* (Hew.)†; *alexina* (Hew.)†, *a. quintina* (Felder)†; *amalda* (Hew.)†, *a. amaldina* (Haensch)†; *amazona* (Haensch)†, *a. ramona* (Haensch)†; *aquata* (Weymer)†; *astrea* (Cramer)†, *a. antaxis* (Haensch)†, *a. flora* (Cramer)†, *a. thimei* (Oberthür)†; *attalia* (Hew.)†; *athalina* (Staud.)†, *a. santineza* (Haensch)†, *a. tremona* (Haensch)†; *baizana* (Haensch)†; *bioculata* (Haensch)†; *caucana* (Staud.)†; *crispinilla* (Hopffer)†; *deronda* (Hew.)†; *egra* (Hew.)†; *estella* (Hew.)†; *fumata* (Haensch)†; *ilerdina* (Hew.)†(?); *lota sexmaculata* (Haensch)†; *lubilerda* (Haensch)†; *makrena* (Hew.)†, *m. makrenita* (Haensch)†; *manora* (Schaus)†; *modesta* (Haensch)†, (Pl. VII, figs. 39, 40); *onega* (Hew.)†, *o. epicharme* (Felder)†, *o. perspicua* (Butler)†; *phemonoe* (Doubleday)†; *quadrata* (Haensch)†; *rubescens* (Druce)†; *solida* (Weymer)†; *susiana* (Felder)†, *s. susanna* (Staud.)†; *tigilla* (Weym.)†; *victorina* (Guérin)†, *v. graciella* (Oberth.)†, *v. padilla* (Hew.)†, *v. paula* (Weym.)†; *zea* (Hew.)†, *z. vicina* (Salvin)†; *zelica* (Hew.)†, *z. pagasa* (Druce)†.

CALLITHOMIA Bates

Callithomia Bates, Trans. Linn. Soc. Lond., xxiii, p. 522, (1862). [Genotype: *Callithomia alixirrhoë* Bates, by designation of Scudder, Proc. Am. Acad. Arts & Sci., x, p. 132, (1875).]

There is considerable difference between the venation of the sexes in this genus. In both, however, is found the bifid hum, the proximal arm of which is well developed, while the distal arm is short.

In the males (Fig. 5) Sc branches from R gradually, running closely parallel as far as a point opposite Cu_2, never much separated from R and finally atrophied proximal of 1d; anterior side of cell very long, reaching nearly to the margin; 1d short, perpendicular to R; Mr well developed, its proximal end nearer than the distal end to R and arises from acutely angled 2d; anterior arm of 2d more than thrice the length of posterior arm; 3d short; cell closed. The hair patch is small, although the hair scales are long, and is located at the base of the cell on R, never extending distally beyond a point opposite Cu_1.

In the females (Fig. 6) Sc is complete, running closely parallel with R for a distance as in the males, but distal of their separation, it angles to the costal margin which it reaches with an up-curve; anterior side of cell little if any longer than the posterior side, cell apex being less than two thirds of the distance to the wing apex; 1d wanting; 3d straight; Mr from the angle of 2d, the arms of which are nearly the same length; Mr parallel R. At the cell apex R is angled.

alixerrhoë Bates†; *hezia* (Hew.)†, (Pl. V, figs. 5, 6), *h. hedila* Godman & Salvin†, *h. tridactyla* Dewitz†; *hydra* Felder†, *h. panamensis* Godman & Salvin†; *megaleas* Godman & Salvin; *phagesia* (Hew.)†; *procne* Godman & Salvin; *villula* (Hew.).

CORBULIS Boisduval

Corbulis Boisduval, Cons. Lep. Guat., p. 32, (1870). [Genotype: *Ithomia agrippina* Hewitson, by designation of Kirby, Zool. Rec., 1870, p. 383.]

Epithomia Godman & Salvin, Biol. Cent. Am., Rhop. I, pp. 32-33, (1879). [Genotype: *Dircenna callipero* Bates, by original designation.]

Kirby's designation of *agrippina* as genotype for *Corbulis* was overlooked by Bryk, who incorrectly designated *gephiria* Hewitson.[16] Bryk's application of the name must be corrected and Godman and Salvin's familiar *Epithomia* must be relegated to the synonymy.

The males (Fig. 9) have a hair patch along the basal half of R; hum is simple, not bifid; Sc and R run closely parallel for a short distance beyond hum, then separate gradually; proximal of the cell apex Sc is atrophied; the short 1d is near the margin, so that the distal segment of R is shorter than the greatest width of the cell; M_1 is curved concave to R; 2d is nearly straight; Mr is very long, reaching into the cell beyond the anterior end of Cu_1, and usually is located opposite M_2; 3d is straight or, when Mr arises from its anterior part, is angled.

In the females Sc and R are closely parallel, nearly merged, for two thirds of the distance to the cell apex; beyond its separation from R, Sc curves to the margin which it reaches nearly opposite the discocellulars; 1d is wanting; M_1 stalks beyond the cell; the long Mr arises from the angle of 3d; 2d is rather straight.

agrippina (Hew.)†, *a. fumantis* (Haensch)†; *alpho* (Felder)†, *a. nikita* (Haensch)†; *xantho* (Felder)†, (Pl. V, fig. 9), *x. hulda* (Felder), *x. methonella* (Weymer)†.

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[16] Lep. Cat., pars 80, p. 615, (1937). Discovery of Kirby's bizarre practice of designating genotypes in his Zoological Record should be credited in this case to d'Almeida. See Rev. Ent. Brasil, x, p. 277, (1939).

DIRCENNA Doubleday, Hewitson & Westwood

Dircenna Doubleday, Hewitson & Westwood, Gen. Diurn. Lep., I, pl. 17, fig. 2, (Aug. 1847); pp. 119-121, (Nov. 1847). [Genotype: *Dircenna iambe* Dbld., Hew. & Westw., by monotypy, pl. 17, Aug. 1847, (=*Ceratinia jemina* Geyer, 1837).]

There can be little doubt that this genus is closely related to *Corbulis*, hence should be associated with the tribe *Oleriini*, despite the reduction to four tarsal joints in the female fore-leg, rather than with the tribe *Ithomiini*. Although this prevents the use of the female fore-tarsus as a pat character for separating the two tribes, it is easy to understand *Dircenna's* position when one realizes that in the *Ithomiinae* evolution takes the form of reduction both in venation and in the forelegs of both sexes. The reduction in the fore-legs of the females of this genus is independent of and indicates no relation to the *Ithomiini*.

With respect to the hair patch of the males *Dircenna* might be divided into two species groups each containing about the same number of species. The genotype, *jemina*, has a single patch which extends from hum nearly to the cell apex. This is true also of *visina* Haensch, *varina* Hewitson, *zelie* (Guérin), and *lenea* (Cramer) among the forms which I have examined. The other group, including *klugii* (Geyer), *olyras* (Felder), *suna* Haensch, *marica* (Felder) and *vandona* Haensch has in addition to the long proximal patch a small tuft at the apex of the cell at 1d. Although I regard this as a fundamental character, I do not erect a new genus because the presence of one or two patches in this case does not seem to be correlated with other characters in the males, and I have been unable to obtain parallel separation of the females, although the many variable characters mentioned below have been studied with this in mind.

In both sexes Sc and R separate at the simple, non-bifid hum. In the males (Fig. 10) the two veins are distinctly separated beyond hum; usually Sc is atrophied proximal of the cell apex, but this is not always so and in a few species and a few specimens Sc reaches with an upward curve the margin at the wing apex. The anterior side of the cell is long, the exact proportional length varying with the species. The terminal segment of R usually is shorter than the greatest width of the cell; 1d is mostly present, short, sometimes vestigial or absent; 2d is more or less strongly curved convex to the cell; the longish Mr is located on 3d near M_2, but 3d is often not strongly angled.

In the females (Fig. 11) the cell is proportionately shorter, the terminal segment of R longer than the greatest width of the cell; 1d if present is short, often absent and M_1 branches from R beyond the cell; 2d straight; 3d and Mr similar to the analogous structures of the males; Sc runs closely parallel to R to a point opposite the cubitals, then angles away toward the margin which it reaches beyond the cell apex. At the point where Sc and R separate there often is a short auxiliary vein connecting them, a vein analogous to the one found in females of *Ceratinia.*

dero (Hübner)†, *d. rhoeo* Felder†; *euteles* (Erschow); *honrathi* (Srnka); *hugia* Schaus†; *jemina* (Geyer)†, *j. bairdii* Reakirt†, *j. euchytma* (Felder)†, (Pl. V, figs. 10, 11); *klugii* (Geyer & Hübner)†, *k. chiriquensis* Haensch; *lenca* (Cramer)†; *loreta* Haensch†; *lorica* Weymer; *mantura* (Hew.)†; *marica* (Felder)†, *m. steinheili* Staud.†; *obfuscata* Butler; *phagesia* (Hew.); *relata* Butler & Druce†, *r. lonera* Butler & Druce†, *r. olyras* (Felder)†; *suna* Haensch†; *vandona* Haensch†, *v. immaculata* (Haensch)†; *varina* (Hew.)†; *visina* Haensch†; *xanthophane* Hopffer†; *zelie* (Guérin)†, *z. epidero* Bates†.

PTERONYMIA Butler & Druce

Pteronymia Butler & Druce, Cist. Ent., I, p. 96, (1872). [Genotype: *Ithomia aletta* Hew., by original designation.]

Ernicornis Capronnier, Ann. Soc. Ent. Belg., XVII, p. 22, (1874). [Genotype: *Papilio euritea* Cramer, by present designation.]

Parapteronymia Kremky, Ann. Zool. Pol. Mus. Hist. Nat., IV, p. 238, (1925). [Genotype: *Pteronymia antisao* (Bates), by monotypy.]

Parapteronymia was proposed as a subgenus, is synonymous with *Pteronymia* and was founded on trifling variation of the genitalia. *Ernicornis* appeared without diagnosis in a list of Brazilian butterflies and included two species, one of which, *Papilio eruitea* Cramer, is herewith designated genotype.

Both sexes of *Pteronymia* may be separated from *Episcada* by the structure of the humeral vein, which in *Pteronymia* is vestigially bifid, having a lobe on its distal side; in *Episcada* hum is clearly non-bifid. Great confusion exists in literature regarding the proper association of the species in these two genera. Godman and Salvin[17] pointed out that in *Pteronymia* the female foretarsus bears setae on the first, second and third joints, while in *Episcada* the setae are only on the second and third joints, not on the first.

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[17] Godman & Salvin, Biol. Cent. Am., Rhop. I, p. 40, (1879).

The males (Fig. 50) have a single hair patch along R from the base to the cell apex; hum is vestigially bifid, the distal arm a mere lobe; Sc and R run side by side for a short distance beyond hum, then separate gradually; Sc reaches the costal margin near the wing apex with an up-curve. In the genotype and in most of the species properly referrable to this genus, 1d and M_1 are entirely wanting; however a few forms must be included which have M_1 very short, branching from R near the margin; 2d is nearly straight; 3d emits a short Mr from its acute angle, the posterior arm of which is about as long as 2d.

In the females (Fig. 51) the venation is the same, except for hum, as in females of *Episcada*. However, Sc has a tendency to be slightly longer in *Pteronymia* reaching the margin nearer the wing apex; also 1d is almost never present and M_1 tends to stalk with R more distal of the cell apex. These two tendencies in no way serve for separating females as individuals into their proper genera; the structure of hum is the only reliable venation character I have found.

adina (Hew.)†; *agalla* (Godman & Salvin)†; *alcmena* (Godman & Salvin)†, *a. tigranes* Godman & Salvin†; *aletta* (Hew.)†; *alissa* (Hew.)†, *a. alissana* Haensch†, *a. alope* Godman & Salvin†; *antisao* (Bates)†; *artena* (Hewitson)†; *asellia* (Hopffer)†; *aselliata* Haensch†; *barilla* Haensch†, (Pl. VIII, figs. 50, 51); *cotytto* (Guérin)†; *donata* Haensch†; *euritea* Cramer†; *fulvescens* Godman & Salvin†; *fulvimargo* Butler & Druce; *latilla* (Hew.)†; *laura* (Staud.)†; *lilla* (Hew.)†; *linzera* (Herrich-Schaeffer)†, *l. alina* Haensch†; *notilla* Butler & Druce†; *oncida* (Hew.)†; *pronuba* (Hew.)†; *simplex* (Salvin)†; *veia* (Hew.)†; *vestilla* (Hew.)†; *zerlina* (Hew.)†, *z. hara* (Hew.)†.

EPISCADA Godman & Salvin

Episcada Godman & Salvin, Biol. Cent. Am., Rhop. I, pp. 40-41, (1879). [Genotype: *Ithomia salvinia* Bates, by original designation.]

The males (Fig. 23) have a single hair patch along R from hum to the cell apex; hum is simple, non-bifid; Sc and R separate a short distance distal of hum, run parallel, but do not touch, to the margin which Sc reaches with an up-curve; 1d usually is present, short, but sometimes is wanting, in which case R and M_1 stalk at the cell apex; 2d is straight or slightly convex to the cell; 3d is about the same length as 2d.

Females can be separated from *Pteronymia* only by the non-bifid hum. Sc and R separate gradually, both complete; 1d mostly wanting, with R and M_1 stalked at the cell apex. In other respects venation resembles that of the males.

apia (Felder)†; *asopo* (Felder)†; *carcinia* Schaus†; *hymenaea* (Prittwitz)†; *mira* (Hew.)†; *primula* (Bates)†; *salvinia* (Bates)†, (Pl. VI, fig. 23); *sylvo* (Hübner & Geyer)†.

HYPOLERIA Godman & Salvin

Hypoleria Godman & Salvin, Biol. Cent. Am., Rhop. I, pp. 52-53, (Section A), (1879). [Genotype: *Hypoleria libera* Godman & Salvin, by original designation, section A.]

Pigritia d'Almeida, Mel. Lep., p. 92, (1922), (preoccupied Clemens 1861). [Genotype: *Rhadinoptera umbraticola* d'Almeida, by monotypy.]

Pigritina Hedicke, Deutsche Ent. Zeit., p. 72, (1923). [Published to replace *Pigritia* d'Almeida.]

Herringia d'Almeida, Bol. Soc. Ent. Brasil, p. 14, (1923), (preoccupied Rondani, 1856). [Genotype: *Rhadinoptera umbraticola* d'Almeida, by original designation.]

Corbulis Bryk, (not Boisduval, 1870), Lep. Cat., pars 80, p. 615, (1937). [Genotype: *Corbulis gephiria* (Hewitson), by original designation.]

Bryk overlooked Kirby's genotype designation for *Corbulis* and named *gephiria*. As noted elsewhere *Corbulis* properly applies to another genus; accordingly, *Hypoleria* is retained for application to Godman and Salvin's group A, as Bryk's limitation of the name to group B does not affect its availability as presently used. I am indebted to Senhor d'Almeida for supplying me with a sketch of the hindwing venation of his *umbraticola;* I am therefore able to affirm that, as he suggested in his letter to me, *Pigritia* d'Almeida and associated names must be subsumed as synonyms for *Hypoleria* Godman and Salvin. Hedike's publication of *Pigritina* is a pathetic example of a deplorable practice followed by certain Continental " students ", that of going over the literature with a fine-toothed comb in order to find preoccupied genus names and suggested species defined but not named; Herr Hedicke, as far as can be learned, never studied specimens of *Ithomiinae.*

The males (Fig. 17) of *Hypoleria* have two hair patches at the costal margin of the hind wing; one is located at the base and is larger, brushlike; a pencil-like patch is near the cell apex; hum is strongly bifid; Sc and R run so closely parallel as to be nearly coalesced as far as a point opposite Cu_2; beyond this point Sc curves away from R, recurves toward it beyond the cell, and is atrophied before reaching the margin; 1d always is present, and like 2d is quite short; M_1 is atrophied before reaching the margin, sometimes near the cell; M_2 is complete, prolonged into the cell as a short Mr; 3d is atrophied at its anterior end, so that the cell is open; the posterior side of the cell is longer than the anterior side in both sexes.

In the females (Fig. 18) Sc is complete, reaching the margin somewhat beyond the cell apex after running close to R as in the males; 1d is invariably wanting, with M_1 branching from R beyond the cell; 2d is short, straight; 3d is angled, emitting the short Mr; the posterior arm of 3d is curved, almost S-shaped, the posterior end of which is much more distal than the cell apex and the terminus of Sc, though proximal of the branching of M_1 and R.

cassotis (Bates)†, *c. rhene* (Godman & Salvin)†, *c. cajona* Haensch†; *cidonia* (Hewitson)†, *c. chrysodonia* (Bates)†, *c. karschi* Haensch†; *cymo* (Hübner)†; *gephira* (Hewitson)†; *mirza* (Hewitson)†, (Pl. VI, figs. 17, 18), *m. riffarthi* Haensch†; *ocalea* (Doubleday, Hewitson & Westwood)†; *quadrona* Haensch†; *proxima* Weymer†; *orianna* (Hewitson)†, *o. famina* Haensch†; *orolina* (Hewitson)†, *o. oculata* Haensch†; *vanilia* (Herrich-Schaffer)†, *v. libera* Godman & Salvin†; *veronica* Weymer†; *virginia* (Hewitson)†; *umbraticola* (d'Almeida)†.

GODYRIS Boisduval

Godyris Boisduval, Cons. Lep. Guat., p. 33, (1870). [Genotype: *Godyris duillia* (Hewitson), by monotypy.]

Dismenitis Haensch, Berlin Ent. Zeit., XLVIII, p. 207, (1903). [Genotype: *Dismenitis zavaleta* (Hewitson), by original designation.]

The males (Fig. 29) bear a single hair patch along R from base to apex of the cell; hum is bifid; Sc and R virtually are coalesced as far as a point opposite Cu_2, beyond which Sc runs evenly curved toward the apex, which it fails to reach, being atrophied opposite the cell apex; R and M_1 reach the wing apex as a single vein, uniting near the margin to form with the short, straight 1d an auxiliary cell; 2d is slightly longer than 1d and nearly at a right angle to it; Mr when present, may be as a continuation of M_2, or may be on 2d; 3d is curved, atrophied at its anterior end so that the cell is open.

In the female (Fig. 30) Sc reaches the margin just distal of the cell apex; the posterior side of the cell is longer than the anterior side, but the posterior end of 3d is as distal as the termination of Sc or the branch of M_1 and R; 1d is wanting invariably; Mr arises from the angle of 3d, the posterior arm of which is S-shaped.

cleonica (Hewitson)†; *crinippa* (Hew.); *dircenna* (Felder)†, *d. pittheis* (Weymer)†; *diversivoca* (d'Almeida)†; *duillia* (Hew.)†; *gonussa* (Hew.)†, *g. petersii* (Dewitz)†; *hewitsoni* (Haensch)†; *pseudodiversivoca* (d'Almeida); *sosunga* (Reakirt)†, (Pl. VII, figs. 29, 30), *s. zygia* (Godman & Salvin)†; *theoudelinda* (Hew.)†, *t. zalmunna* (Hew.)†; *zavaleta* (Hew.)†, *z. amaretta* (Haensch)†, *z. telesilla* (Hew.)†.

MCCLUNGIA new genus*

Males may be distinguished from *Pseudoscada,* in which *salonina* formerly was placed, by the bifid hum, by the two hair patches, and by the absence of the terminal segment of R; distinguished from *Hypoleria* by the shorter Sc and by the absence of the terminal segment of R, this last a remarkable character unique among the *Ithomiinae.* The females differ from *Pseudoscada* in the venation at the end of the cell and by the humeral vein. I do not possess enough material to make a satisfactory key difference from *Hypoleria,* which the only *Mcclungia* female in the Academy collection closely resembles. However, the anterior arm of 3d seems longer in proportion to 2d, and Mr seems longer; in the forewing both recurrents are present and well developed, while in *Hypoleria* only one is generally present.

Males (Fig. 28) have two hair patches, one from the bifid hum to half way to the cell apex, the other at the cell apex, small and pencil-like; Sc runs closely parallel to R for a distance, then arches away and is atrophied just beyond the cell apex; the round, raised place under the basal hair patch around which Sc detours in *Hypoleria* is wanting in *Mcclungia.* The terminal segment of R is wanting, vestigially present in some examples as a slight thickening at the juncture of R and 1d; in one specimen examined it is present, 3 mm. long; 1d and 2d both short, the same length; M_1 atrophied short of the margin; M_2 and M_3 complete; Mr short, opposite M_2; 3d nearly straight, its anterior half wanting; cell open.

Females with bifid hum; Sc and R closely parallel to a point opposite Cu_2, where Sc angles sharply away and reaches the margin just beyond the cell apex; 1d wanting, M_1 stalked 3 to 4 mm. beyond the cell; 2d very short, less than half the length of the anterior arm of 3d; Mr long, from the angle of 3d, the posterior arm of which is "S"-shaped.

GENOTYPE: *Ithomia salonina* Hewitson, Exot. Butt., I, Ithomia 86, (1855).

Mcclungia salonina praeceptrix new subspecies

Male: Both wings transparent with a yellowish tinge, borders brown-black.' On the dorsal surface of the forewing the dark marginal color extends between R and the costal margin from base to cell apex; a thinly scaled brown-black triangular half-band covers the discocellulars; an opaque yellow spot, about 3 x 1 mm., indents the marginal stripe just distal of the cell apex. This spot forms the anterior end of a yellow band which extends down to M_3; within this band the veins M_1 and M_2 are yellow, while the band between the veins is faintly and transparently yellow. The marginal band is wider at the apex of the wing, gradually narrowing toward the anal angle. The area between Cu_2 and the anal margin is black-brown. The inner side of the marginal band is even, except for three short, faint streaks from the margin running proximal, respectively between M_1-M_2, M_2-M_3, M_3-Cu_1. Except where they are crossed by the yellow discal band, the veins all are dark. Additional yellow-transparent areas are between Cu_1-Cu_2 and faintly in the cell.

The hind wing dorsal surface is margined by a band 1.5 mm. wide, brown-black, running from the base along the costal margin to the apex, down the outer margin to the anal veins, where it narrows and disappears. All veins in the hind wing are dark. There is a slight yellow-transparent scaling throughout the hind wing, stronger in the cell.

On the ventral surface the marginal band of the fore wing is solidly dark near the base on the costal margin and along the entire anal margin. On the costal margin, from near the base to the apex and along the distal margin the band is brown-orange edged distal with black, faintly so proximal. The discocellular band and the opaque yellow costal spot are repeated from above. At the apex against the distal side of the brown-orange band are two silver-white oblong spots between R_4-R_5, R_5-M_1. These spots are about 1.5 x .5 mm. and are bordered with fine black lines. A third spot, similar in color but much smaller and not well defined is between M_1-M_2.

Ventrally the hind wing has the band at the costal margin anterior of Sc brown-orange. Under the hair patch the band is black. The rest of the marginal band is brown-orange edged strongly on the distal side with black, faintly so on the proximal side. Three elongated, black-edged, silver-white spots appear in the margin at the distal edge of the brown-orange band; they are between M_2-M_3, M_3-Cu_1, Cu_1-Cu_2. The veins are brownish-yellow in the discal area.

The antennae are dark brownish-black; palpi white with a black stripe on the sides toward the eyes, which are circled with white scales; frons black; white spots on shoulders; legs striped black and white; fore-legs with tibia and tarsus much reduced; abdomen ashen ventrad, brown-black dorsad.

Type.—Male; "Upper Rio Marañon, Peru; Nov. 19, 1924; H. Bassler Col." [American Museum of Natural History; type No. 28,700.]

Two male *paratypes*: One with data as in the type, in collection of the Academy of Natural Sciences of Philadelphia. The other paratype: "2°-4° S 78° W, xi-xii, 1934, altitude 875 M. Ecuador, W. Von Hagen", in collection American Museum of Natural History.

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[*] This genus and this subspecies are named in honor of Dr. Clarence E. McClung, Professor of Zoology at the University of Pennsylvania.

salonina (Hew.)†, *s. arcuata* (Tessmann), *s. subtilis* (Haensch), *s. praeceptrix* new subspecies†, *s. trepotis* (Haensch).

PSEUDOSCADA Godman & Salvin

Pseudoscada Godman & Salvin, Biol. Cent. Am., Rhop. I, p. 55, (1879). [Genotype: *Ithomia pusio* Godman & Salvin, by original designation.]

Languida d'Almeida, Mel. Lep., p. 92, (1922). [Genotype: *Rhadinoptera genetyllis* d'Almeida, by monotypy.]

Senhor d'Almeida kindly supplied me with a sketch of the hindwing venation of his *genetyllis*, and I agree with the suggestion contained in his letter to me that *Languida* ought to be a synonym for *Pseudoscada*.

The males (Fig. 45) bear a single brush-like hair patch along R, base to cell apex; hum simple, non-bifid; Sc coalesced with R as far as a point opposite Cu_2, beyond which Sc is immediately atrophied; in some specimens it is a mere prominence on R; usually it is a few millimeters long, but very slender and weakly developed; in no case does it reach the margin; 1d and 2d are short, straight; in some examples 2d is reduced posterior and fails to reach M_2; 3d is long, curved, atrophied anterior so that the cell is open; Mr is present.

The veins in the female (Fig. 46) all are complete. Sc and R run side by side, touching but not coalesced, as far as a point opposite Cu_2; beyond this point Sc runs gradually to the margin which it reaches slightly distal of the cell apex, while R is gently convex to the cell; 1d often is wanting, with M_1 stalked well beyond the cell; when present 1d is, like 2d, short and straight; 3d is long, angled, the posterior arm curved; a definite though often minute Mr arises from the angle of 3d.

adasa (Hew.)†, *a. erruca* (Hew.)†; *egla* (Hew.)†, *e. aureola* (Bates)†; *genetyllis* (d'Almeida)†; *lavinia* (Hew.)†, *l. troetschi* (Staud.)†; *timna* (Hew.)†, *t. arzalia* (Hew.)†, *t. seba* (Hew.)†; *utilla* (Hew.)†, (Pl. VIII, figs. 45, 46).

GRETA Hemming

Greta Hemming, Gen. Nam. Hol. But., I. p. 28, (1934). [Genotype: *Hymenitis diaphane* Hübner, by original designation.] [18]

Hypoleria Godman & Salvin, Biol. Cent. Am., Rhop. I, pp. 52-53, section B, (1879). [Genotype: *Ithomia polissena* Hewitson, by original designation, section B.]

Hymenitis Hübner, Verz. b. Schmet., p. 8, (1816), (preoccupied Anonymous, 1807). [Genotype: *Hymenitis diaphane* Hübner, by designation of Scudder, Proc. Am. Acad. Arts & Sci., x, p. 193, (1875).] [18]

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[18] Whatever be the true identity of *H. diaphane* Hübner, for purposes of genotype fixation, it is synonymous with *Papilio diaphanus* Drury, since Hübner himself thought he was dealing with the Drury insect, as his synonymy on p. 8 of the Verzeichniss indicates.

As originally used by Godman and Salvin, the genus *Hypoleria* was divided into sections A and B, which correspond respectively to two separate genera according to modern definition. For either of the genera to which the name might apply, *Hypoleria* would have precedence, but it is here used for the original group A, which would be otherwise without name; for group B, the present name, Hemming's *Greta,* applies.

The males (Fig. 27) have a single hair patch along R, base to cell apex, hum simple, non-bifid and reaching well into the humeral lobe; Sc, though not coalescing with R, runs close beside it for a distance, then branches away and is atrophied short of the margin and proximal of the cell apex; R is atrophied before reaching the margin, or infrequently combines with M_1 to form an auxillary cell; 1d is always present, short; 2d likewise is short and straight, often unconnected at its posterior end; M_2 usually is atrophied at its proximal part, but always definitely present near the margin; 3d is curved, atrophied anteriorad; the cell open.

In the females (Fig. 26) Sc reaches the margin proximal of the cell apex; 1d is short, straight; 3d is angled and usually gives rise to a short Mr; 2d is wholly wanting, M_1 and M_2 stalk well beyond the cell, sometimes nearly at the margin.

Superficially the species in this genus are extraordinarily similar to those of *Godyris.* Although there are half a dozen or so different maculation and color patterns in *Greta,* nearly every one has an identical counterpart in *Godyris*; sometimes this similarity is so perfect to the most minute detail that color and pattern characters cannot separate them. The genera can be distinguished in both sexes by means of the venation; in *Greta* hum is non-bifid, in *Godyris* hum is distinctly bifid.

alphesiboea (Hew.)†; *andromica* (Hew.)†, (Pl. VI, figs. 26, 27), *a. andania* (Hopffer)†, *a. dromica* (Haensch)†, *a. lyra* (Salvin)†; *anette* (Guérin)†; *cubana* (Herrich-Schaeffer)†; *dercetis* (Dbld., Hew. & Westw.)†, *d. libethris* (Felder)†, *d. ochretis* (Haensch)†; *diaphanus* (Drury)†; *esula* (Hew.)†; *kedema* (Hew.)†, *k. albinotata* (Butler)†; *morgane* (Geyer)†, *m. moschion* (Godman & Salvin)†; *nero* (Hew.)†; *nerina* (Haensch)†; *ortygia* (Weymer)†; *oto* (Hew.)†; *polissena* (Hew.)†, *p. umbrana* (Haensch)†; *quinta* (Staudinger)†.

HETEROSAIS Godman & Salvin

Heterosais Godman & Salvin, Biol. Cent. Am., Rhop. I, p. 60, (1880). [Genotype: *Ithomia nephele* Bates, by original designation.]

Rhadinoptera d'Almeida, Mel. Lep., p. 78, (1922). [Genotype: *Heterosais nephele* (Bates), by designation of Riley, Entom., LVII, p. 68, (1924).]

The males (Fig. 13) bear two hair patches, the basal one extending from the stalk of Sc and R to about two-thirds of the distance to the cell apex, and is raised ventrad; the distal patch is small, pencil-like, and is located at the apex of the cell; hum simple, non-bifid; Sc and R run side by side just distal of hum, then stalk; distal of their separation, Sc curves away, then recurves to be atrophied proximal of the cell apex; R is strongly convex to the cell along the proximal hair patch; 2d is short, unconnected with M_1; 1d entirely wanting; cell open; M_2 and 3d complete, the latter sharply angled near its anterior end, and bearing a short Mr.

In the females (Fig. 14) Sc and R run side by side to half the distance to the cell apex, then Sc gradually runs to the costal margin which it reaches just distal of the cell apex; 2d is short, straight; 1d and M_1 wanting; 3d angled, emitting a short Mr. A specimen of *H. cadra* Godman & Salvin in the Academy collection has a small loop like a needle's eye on R beyond the cell; the posterior part of this loop probably is a vestige of M_1.

cadra Godman & Salvin†; *edessa* (Hew.)†, *e. gedera* (Hew.)†, *e. nephele* (Bates)†, (Pl. V, figs. 13, 14); *giulia* (Hew.)†; *pallidula* Haensch†.

AN UNRECOGNIZED NAME

Pseudomechanitis Röber, Ent. Zeitschr., XLIV, pp. 20-21, (1930). [Genotype: *Pseudomechanitis paradoxa* Röber, by monotypy.]

Whether or not this name can stand I am unable to say. The genotype was described from a single male specimen. No other form has been referred to the genus; there is no other reference in literature either to this genus or to this species beyond the original description. No example from any of the large collections I have examined seems to belong to the name. Röber claimed his specimen has the wing shape of *Mechanitis* but the venation of *Epithomia* (*Corbulis*); his description is inadequate with respect to venation, making no reference to humeral or subscostal of the hind wing, or to any other character of generic value. Possibly Röber's insect was merely a *Mechanitis* with aberrant venation—a not uncommon event. Lacking pertinent material, I can only suggest that *paradoxa,* if it is a good species, probably may be subsumed in some other genus and that *Pseudomechanitis* is not needed; however I cannot at present decide its position in synonymy. The type specimen is in Röber's collection in Germany and has not been available to me for study.

EXPLANATION OF FIGURES

Venation of hind wing

(All specimens from the collection of the Academy of Natural Sciences of Philadelphia, except where noted.)

PLATE V

Figure 1—*Aeria eurimedia agna* Gdm. & Slv. ♂. Guapiles, Costa Rica.
Figure 2—*Aeria eurimedia agna* Gdm. & Slv. ♀. Costa Rica.
Figure 3—*Athesis acrisone* Hew. ♂. Ecuador.
Figure 4—*Athyrtis mechanitis salvini* Srnka ♂. Upper Amazons.
Figure 5—*Callithomia hezia* Hew. ♂. Guapiles, Costa Rica.
Figure 6—*Callithomia hezia* Hew. ♀. Costa Rica.
Figure 7—*Ceratinia tutia* Hew. ♂. Eden, Nicaragua.
Figure 8—*Ceratinia nise* Cr. ♀. Aveirs, Para, Brazil.
Figure 9—*Corbulis xantho* Felder ♂. Santa Catharina, Brazil.
Figure 10—*Dircenna jemina euchytma* Felder ♂. Chiriqui, Costa Rica.
Figure 11—*Dircenna jemina euchytma* Felder ♀. Eden, Nicaragua.
Figure 12—*Elzunia pavonii* Butler ♂. Dos Puentos, Ecuador.
Figure 13—*Heterosais edessa nephele* Bates ♂. Pejivalle, Costa Rica.
Figure 14—*Heterosais edessa nephele* Bates ♀. Narajapata, Ecuador.

PLATE VI

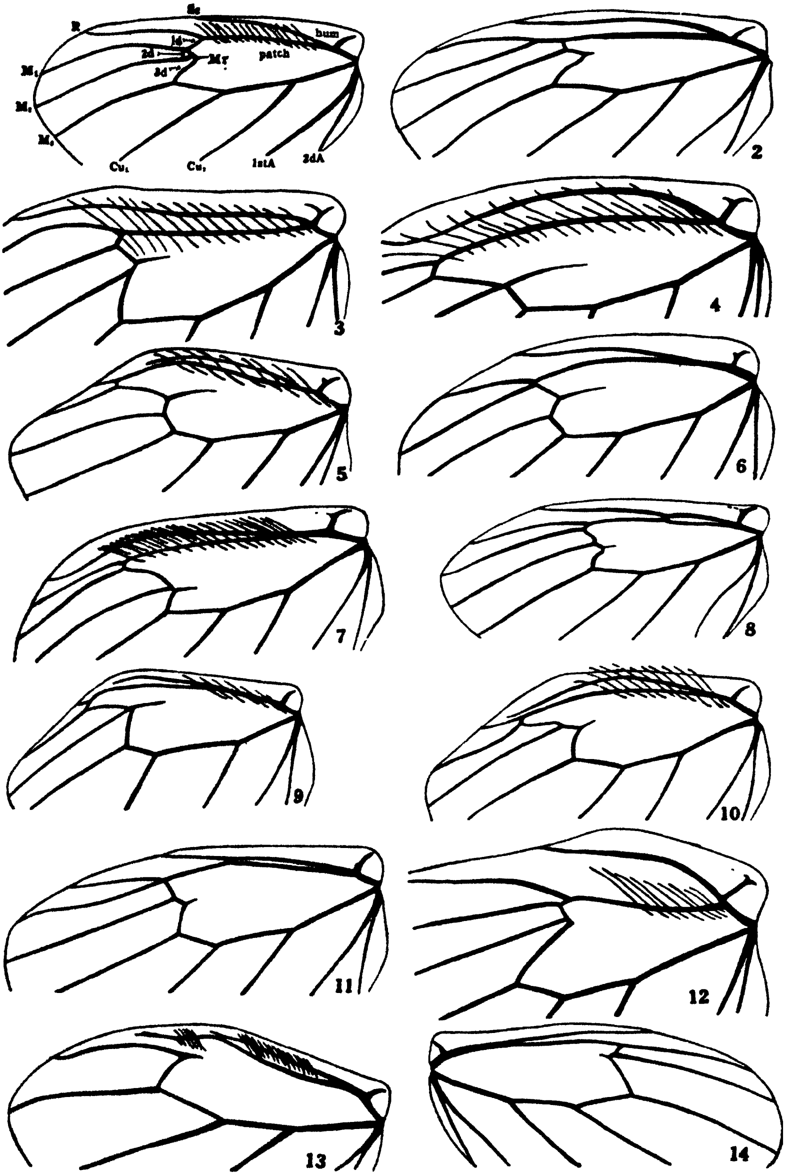
Figure 15—*Hyalyris coeno* Dbld., Hew. & Westw. ♂. Cebrada, Cotiza, Venezuela (U. S. N. M.).
Figure 16—*Hyalyris cocno* Dbld., Hew. & Westw. ♀. Caracas, Venezuela (d'Almeida).
Figure 17—*Hypoleria mirza* Hew. ♂. Naranjapata, Ecuador.
Figure 18—*Hypoleria mirza* Hew. ♀. Dos Puentos, Ecuador.
Figure 19—*Hyposcada evanides* Haensch ♂. Guapiles, Costa Rica.
Figure 20—*Hyposcada evanides* Haensch ♀. (No data.)
Figure 21—*Hypothyris ninona* Hübner ♂. British Guiana.
Figure 22—*Hypothyris ninona* Hübner ♀. Para, Brazil.
Figure 23—*Episcada salvinia* Bates ♂. Rosario, San Juancto Mts., Honduras.
Figure 24—*Eutresis hyperia* Dbld., Hew. & Westw. ♂. Colombia.
Figure 25—*Episcada salvinia* Bates ♀. Rosario, San Juancto Mts., Honduras.
Figure 26—*Greta andromica* Hew. ♀. Huigra, Ecuador.
Figure 27—*Greta andromica* Hew. ♂. Dos Puentos, Ecuador.
Figure 28—*Mcclungia salonina praeceptrix* new subspecies, ♂. Ecuador.

PLATE VII

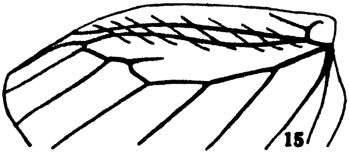
Figure 29—*Godyris sosunga* Reakirt ♂. Costa Rica.
Figure 30—*Godyris sosunga* Reakirt ♀. Eden, Nicaragua.
Figure 31—*Ithomia agnosia* Hew. ♂. Venezuela.
Figure 32—*Ithomia agnosia* Hew. ♀. Venezuela.
Figure 33—*Miraleria sylvello* Hew. ♂. Dos Puentos, Ecuador.
Figure 34—*Melinaea egina* Cr. ♂. Upper Amazons, Brazil.
Figure 35—*Mechanitis polymnia* L. ♂. Parambribo, Dutch Guiana.
Figure 36—*Mechanitis polymnia* L. ♀. Parambribo, Dutch Guiana.
Figure 37—*Napeogenes stella aster* Godman ♂. Naranjapata, Ecuador.
Figure 38—*Napeogenes stella aster* Godman ♀. Bucay, Ecuador.
Figure 39—*Oleria modesta* Haensch ♂. Dos Puentos, Ecuador.
Figure 40—*Oleria modesta* Haensch ♀. Bucay, Ecuador.
Figure 41—*Olyras montagui staudingeri* Gdm. & Slv. ♂. Cachi, Costa Rica.
Figure 42—*Miraleria sylvello* Hew. ♀. Bucay, Ecuador.

PLATE VIII

Figure 43—*Patricia dercyllidas* Hew. ♂. Huigra, Ecuador.
Figure 44—*Patricia dercyllidas* Hew. ♀. Huigra, Ecuador.
Figure 45—*Pseudoscada utilla* Hew. ♂. Dos Puentos, Ecuador.
Figure 46—*Pseudoscada utilla* Hew. ♀. Dos Puentos, Ecuador.
Figure 47—*Scada zibia* Hew. ♂. Bucay, Ecuador.
Figure 48—*Scada zibia* Hew. ♀. Ventura Ecuador.
Figure 49—*Placidula euryanassa* Felder ♂. Santa Catharina, Brazil.
Figure 50—*Pteronymia barilla* Haensch ♂. Naranjapata, Ecuador.
Figure 51—*Pteronymia barilla* Haensch ♀. Naranjapata, Ecuador.
Figure 52—*Sais rosalia camariensis* Haensch ♀. British Guiana.
Figure 53—*Sais rosalia camariensis* Haensch ♂. British Guiana.
Figure 54—*Tithorea furia* Staud. ♂. Venezuela.
Figure 55—*Thyridia themisto* Hübner ♂. Villa Rica, Paraguay.
Figure 56—*Velmysta peninna* Hew. ♂. Bolivia.
Figure 57—*Xanthocleis psidi* L. ♂. Rio Madeiro, Brazil.



FOX—GENERA OF THE ITHOMIINAE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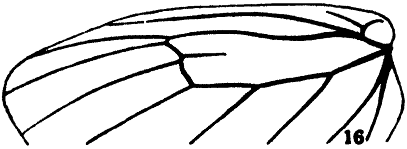
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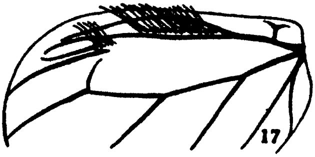
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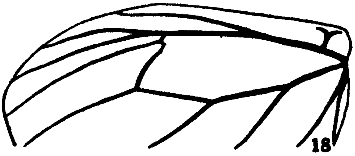
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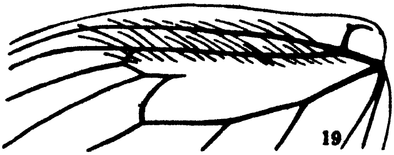
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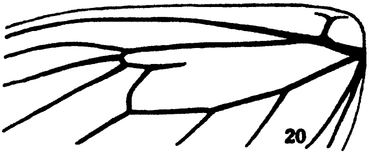
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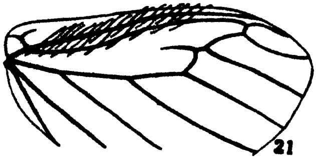
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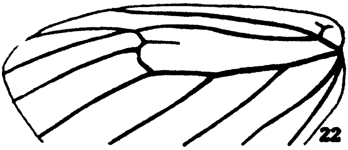
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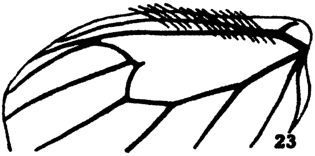
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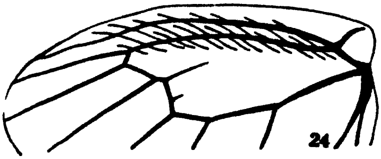
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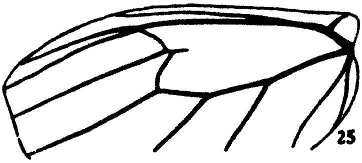
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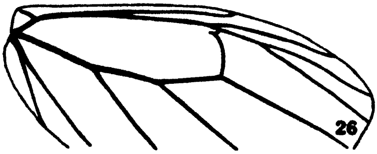
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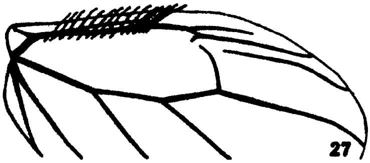
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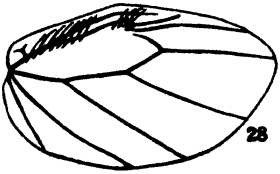
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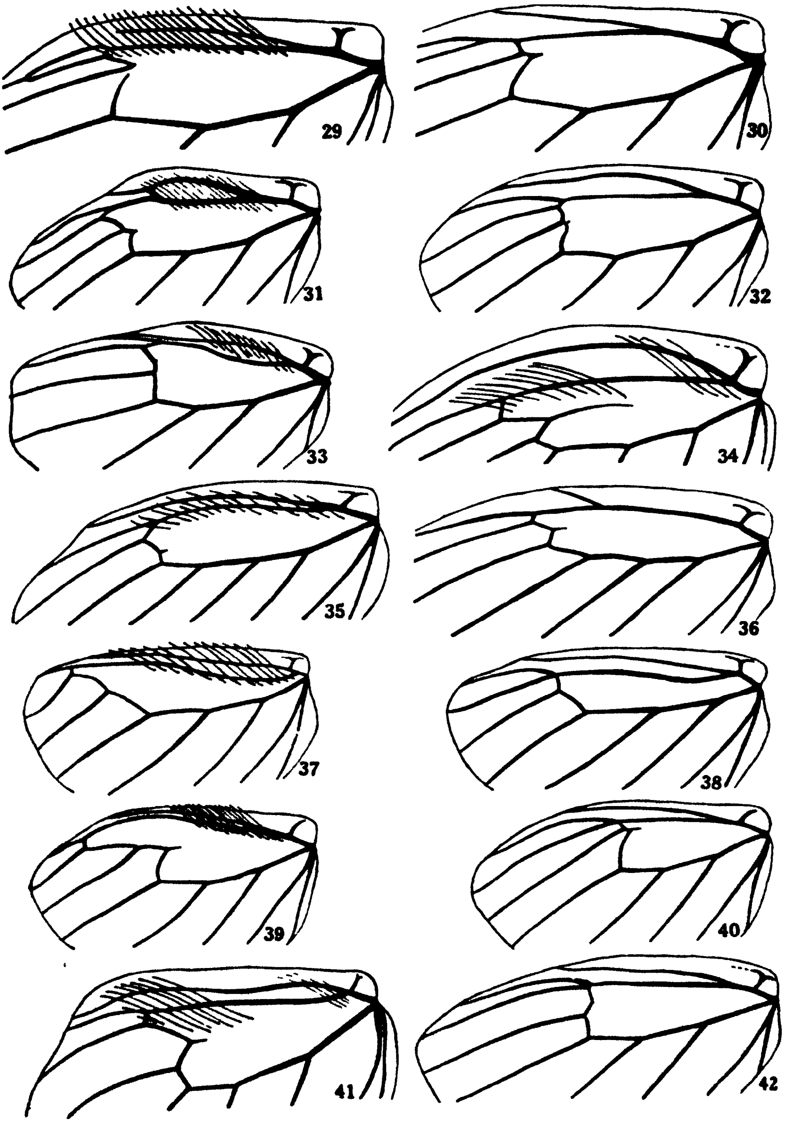
FOX—GENERA OF THE ITHOMIINAE



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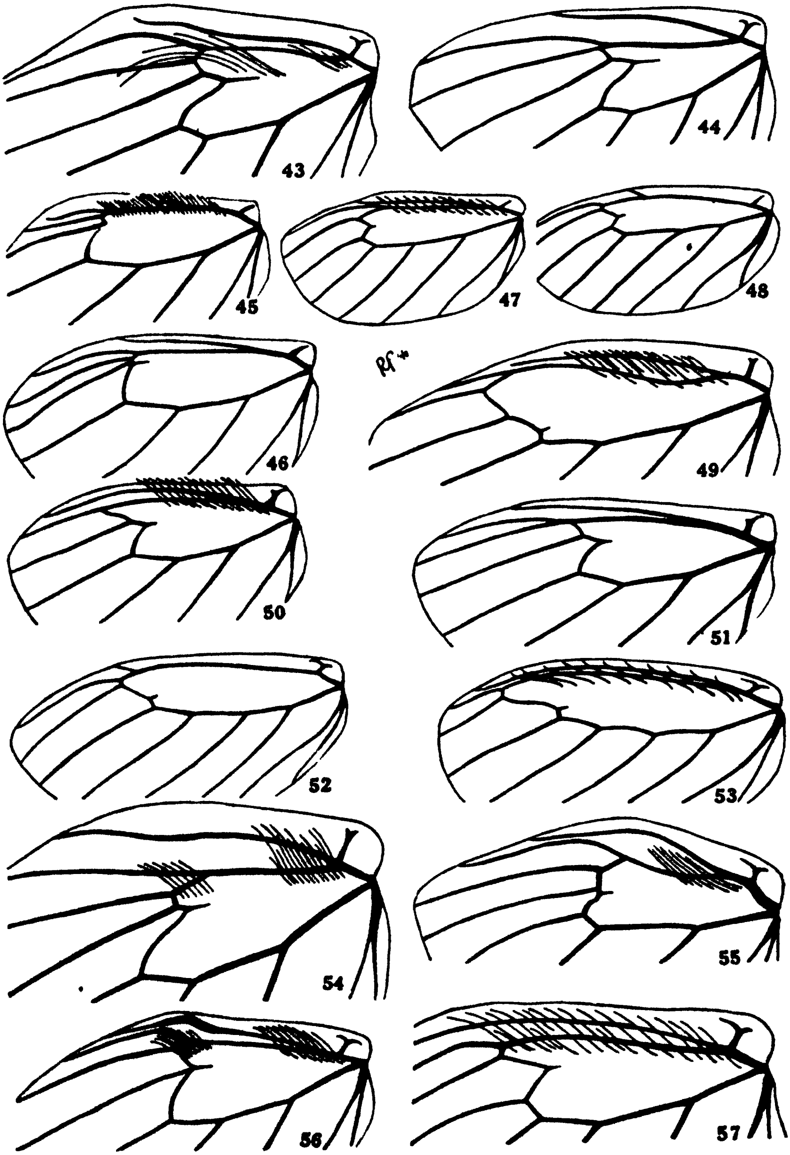

FOX—GENERA OF THE ITHOMIINAE

THE TAXONOMY OF THE OXYBELINE WASPS
(HYMENOPTERA: SPHECIDAE)
II. The Classification of the Genera Belomicrus and Enchemicrum

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(Five text-figures)

The prefatory remarks to Part I[1] of this series gave the reasons for its presentation, and the reader is referred to this earlier contribution for my introductory remarks.

The present paper is a direct continuation of the first of these studies; it comprises a discussion of the taxonomy, ethology and distribution of *Belomicrus*, and terminates with a review of the North American genus *Enchemicrum*.

TAXONOMY

The genus *Belomicrus* is one of the most clearly defined groups of the Oxybelini and occupies an intermediate position in their generic evolution. Phylogenetically, it stands about midway between the more primitive genera such as *Belomicroides* and *Brimocelus* and the higher, more specialized groups like *Enchemicrum* and *Oxybelus,* although on the whole its affinities lie more with the latter two genera than with the former ones. But although *Belomicrus* represents an archaic group in comparison with the highly evolved, widely distributed, multispecific genus *Oxybelus,* it is not ancestral to it, nor to *Enchemicrum*. The present genus probably arose from a stock like that of *Brimocelus* and forms a very ancient, autochthonous line of descent of its own which has not given rise to any other entities, so far as is known at present. As in many other genera that have persisted through long geological periods and thus had time to mature, *Belomicrus* often exhibits extraordinary structural characters whose usefulness is extremely doubtful or at least not apparent. The discontinuous type of distribution and such facts as are known concerning its biology offer additional confirmatory evidence which substantiate the fact that *Belomicrus* is a relatively ancient group.

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[1] Pt. I.: Trans. Amer. Ent. Soc., LXVI, pp. 1-99, (1940).

The subjoined key will serve to separate the twenty-six forms described in my earlier paper.

Key to the Nearctic Forms of Belomicrus

1. Antennae thirteen-segmented; seven abdominal tergites visible; males 2
   Antennae twelve-segmented; six abdominal tergites visible; females 21

2. Squamae subrectangular in shape, oblique in position, almost contiguous behind and completely enclosing the subtriangular postscutellum; a distinct pygidial area usually absent and the first abdominal tergite generally without a distinct impressed median longitudinal furrow on the basal half; [FORBESII SERIES]........................3
   Squamae more or less semilunate, semicircular, subreniform, or subfalcate in shape, lateral in position, not contiguous behind nor enclosing the transverse subrectangular postscutellum; a distinct subquadrate or subrectangular pygidial area present and the first abdominal tergite usually with a distinct impressed median longitudinal furrow on basal half; [VIERECKI SERIES].................12

3. Mandibles with the lower margin distinctly excised; ultimate abdominal tergite with a more or less distinct pygidial area..............4
   Mandibles with the lower margin entire, or at most subemarginate; ultimate abdominal tergite rarely with a pygidial area.............5

4. Squamae with transverse carinulae; fore tarsi without a pecten; postocellar distance five times the ocellocular line; clypeus with the median lobe simply truncate apically; hypopygium subtruncate and bisinuate apically; (Colorado Desert, California); [CAHUILLA GROUP] *cahuilla* Pate
   Squamae ecarinulate; fore tarsi with a small pecten; postocellar distance two and one-half times the ocellocular line; clypeus with the median lobe truncate apically and cuspidate medially; hypopygium with the apical margin rounded and entire; (Tularosa Basin, New Mexico); [QUERECHO GROUP].......................*querecho* Pate

5. Clypeus tumid discally, the apical margin of the median lobe convexly arcuate and angulate medially or truncate and cuspidate medioapically; hypopygium flat, glabrous and nitidous throughout, the apex

entire and broadly rounded; last abdominal tergite without any traces of a pygidial area; fore tarsi with vestiges of a pecten; [FORBESII GROUP] 6

Clypeus more or less tuberculate discally, the apical margin of the median lobe truncate, retuse or emarginate; hypopygium tumid or gibbous discally, and punctate and pubescent basally or distally, or both, the apex retuse or emarginate medially; last abdominal tergite sometimes with rudiments of a trapeziform pygidium evident; fore tarsi without traces of a pecten; [FRANCISCUS GROUP].............9

6. Vertex with an acute tubercle behind each compound eye............7

Vertex at most merely angulate or with a low rounded callosity behind each compound eye..8

7. Mucro spatulate apically; clypeus with the apical margin of the median lobe squarely truncate and cuspidate medially; penult abdominal sternite with a strong longitudinal arcuate welt laterally on each side; (southern California) ....*cooki* Baker

Mucro acuminate apically; clypeus with the apical margin of median lobe more or less arcuate and angulate medially; penult abdominal sternite without such arcuate welts..............................8

8. Mesothoracic epipleura anteriorly beneath tegulae with a dorsally directed pocket which is open ventrally; (Sierra Nevada and southern Cascade Ranges of California and Oregon)..*forbesii penuti* Pate

Mesothoracic epipleura simple, without such pocket; (British Columbia and central Oregon to central Manitoba, North Dakota and Colorado)................................*forbesii forbesii* (Robertson)

9. Clypeus with the apical margin of the median lobe more or less retuse or emarginate and furnished with an impressed area or bevel; post-temporal region of head punctate...............................10

Clypeus with the apical margin of the median lobe truncate and without an impressed area or bevel distally on the raised, glabrous, nitidous, equilaterally triangular, flat, obliquely declivent discal platform which terminates in the median lobe, the apical width of which is twice the height of the platform; post-temporal region of head glabrous and nitidous; front without an impressed line from the anterior ocellus; (Los Angeles and Riverside Counties, California) *serrano serrano* Pate

10. Clypeus with the median lobe broad, the distal width three times the length of the distance measured from the discal tubercle to a line drawn between the distolateral angles, subapically with a sharp, oblique edge or margin from the distolateral angles to the discal tubercle, distad of which is a very narrow, linear, concave, inflexed nitidous bevel, the apical margin deeply and widely emarginate; (Riverside County, California).......................*jurumpa* Pate

Clypeus with the median lobe narrower, the distal width not more than twice the length of the distance measured from the discal tubercle to a line drawn between the distolateral angles, and with a flat or rounded ridge from the distolateral angles to the discal tubercle, distad of which is a broad, flat, impressed subinfundibuliform, glabrous, nitidous area which is more or less emarginate medioapically 11

11. Post-temporal region of head coarsely punctate; clypeus with the median lobe narrow, the distal width not more than one and one-third times the length of the distance measured from the discal tubercle to a line drawn between the distolateral angles and with the apical margin of the lobe retuse or shallowly emarginate medially; (Salton Trough, southern California) .... *quemaya* Pate

Post-temporal region of head acupunctate; clypeus with the median lobe wider, the distal width twice the length of the distance measured from the discal tubercle to a line drawn between the distolateral angles, and with the apical margin of the lobe distinctly and strongly emarginate medially; (San Francisco Bay region, California) *franciscus* Pate

12. Temporal carinae present and well developed below; a low nitidous callosity behind each compound eye; fore coxae normal, not obliquely sulcate anteriorly; squamae falcate; discal areole of posterior face of propodeum obtrigonal; (New Mexico to California); [VIERECKI GROUP] .... *viereckí* Pate

Temporal carinae absent; an acute, opaque tubercle behind each eye; discal areole of posterior face of propodeum obcuneate 13

13. Scapes angustate; fore coxae normal, not sulcate anteriorly; squamae subreniform; (Colorado Desert, California); [SECHI GROUP] *sechi* Pate

Scape normal, slender, cylindrical, or obterete; fore coxae with a broad oblique sulcus on anterior surface 14

14. Squamae slender, falciform; discal areole of posterior face of propodeum with an oblique carinule emanating from each dorsolateral angle; puncturation of body rather coarse; eastern forms; (Virginia); [BRIDWELLI GROUP] .... *bridwelli* Pate

Squamae broad, subsemicircular, semilunate or subreniform, the apices blunt or truncate; discal areole without such carinules emanating from it; puncturation of body usually finer; western forms; [CLADOTHRICIS GROUP] 15

15. Squamae semicircular or semilunate, the inner margins straight, parallel or subparallel; black forms 16

Squamae subreniform, the inner margins arcuate, usually distinctly curved and converging posteriorly; abdomen frequently wholly or in part red 17

16. Vertex and mesonotum finely punctate; interantennal line twice the length of the antennocular distance; clypeus truncate, the apical margin of the median lobe with a narrow transverse nitidous linear bevel provided with a dorsal margin; (Snake River Plains, Idaho) *minidoka* Pate

Vertex and mesonotum coarsely punctate; interantennal line and antennocular distance subequal; clypeus with the median lobe convexly arcuate distad and fulgid medio-apically, but without a distinct margin dorsally to the subbevelate portion; (southern California) *timberlakei* Pate

17. Distance between the antennal sockets subequal to that between them and the nearest eye margin....................................18

Distance between the antennal sockets distinctly longer, usually about twice that between them and the nearest eye margin.............19

18. Postocellar distance five times the length of the ocellocular line; squamae more or less spatulate apically; propodeum with lateral faces more or less opaque and distinctly favose throughout; rather coarsely punctate forms with the abdomen wholly black; (Colorado Desert, California)..................................*tuktum* Pate

Postocellar distance three times the length of the ocellocular line; squamae not spatuloid apically; propodeum with lateral faces more or less fulgid, subnitidous discally; rather finely punctate forms with the basal abdominal tergites reddish; (Colorado Desert, California) *istam* Pate

19. Vertex, mesonotum and abdomen all more or less opaque and with fine contiguous punctures; mucro rather stout and broad with the apex truncate; clypeal bevel transversely linear and rather poorly defined dorsally; (aestival and autumnal forms of the Transverse and Coastal Ranges, northward to the Salinas Valley district of California)..............................*cladothricis eriogoni* Pate

Vertex, mesonotum and abdomen more or less fulgid, with fine distinctly separate punctures; mucro relatively slender..............20

20. Clypeal bevel transversely linear, rather poorly defined dorsally; width of front measured at distal end of scapes but one-half the vertical length of eye; (aestival to autumnal forms ranging from central New Mexico to the Mohave Desert of California and thence northward)........................*cladothricis cladothricis* (Cockerell)

Clypeal bevel flatly trigonal, rather well defined dorsally; width of front measured at distal end of scapes five-eighths the vertical length of eye; (vernal forms of the Colorado Desert and adjacent regions of southern California)..................*cladothricis prosopidis* Pate

21. Squamae subrectangular, oblique in position, almost contiguous behind and completely enclosing the subtrigonal postscutellum; [FORBESII SERIES]..22

Squamae more or less semilunate, semicircular, subreniform or falcate in shape, lateral in position, not contiguous behind nor enclosing the transverse subrectangular postscutellum; [VIERECKI SERIES] 31

22. Prepectus anteriorly with a strong translucent laminate margin ending ventrally on mesepisterna in a caudally directed tooth; mesepisterna ventrally on each side with a blunt tooth; (Mohave Desert, California); [VANYUME GROUP] .... *vanyume* Pate

Prepectus anteriorly without such a laminate margin and mesepisterna edentate 23

23. Clypeus medio-apically with a projecting ancoriform process; temples well developed, their postocular length one and one-half times that of scape; (south-central New Mexico); [APACHE GROUP]. *apache* Pate

Clypeus arcuate, truncate, retuse or emarginate medio-apically, without such a process; temples normal, postocular length not more than that of scape 24

24. Clypeus tumid discally and with the apical margin of the median lobe convexly arcuate and angulate medially or truncate and indistinctly cuspidate medio-apically; [FORBESII GROUP] 25

Clypeus more or less tuberculate discally and with the apical margin of the median lobe emarginate, retuse or truncate; [FRANCISCUS GROUP] 28

25. Vertex with an acute tubercle behind each eye; (southern California). *cookii* Baker

Vertex at most merely angulate or with a low rounded opaque callosity behind each eye 26

26. Pygidium opaque, with a fine favose sculpture between the coarse punctures; mucro more or less abruptly widened and subspatulate apically; postscutellum short, caliciform; (western Nevada to southern Idaho) .... *coloratus* Baker

Pygidium fulgid, without fine favose sculpture between the coarse punctures; mucro not appreciably widened apically; postscutellum longer, trigonal 27

27. Mesothoracic epipleura anteriorly beneath tegulae with a dorsally directed pocket which is open ventrally; (Sierra Nevada and southern Cascade Ranges of California and southern Oregon). *forbesii penuti* Pate

Mesothoracic epipleura simple, without such pocket; (southern British Columbia and Manitoba south to central Oregon and Colorado). *forbesii forbesii* (Robertson)

28. Clypeus with the median lobe broad, the distal width three times the length of the distance measured from the discal tubercle to a line drawn between the distolateral angles, the clypeal bevel very narrow, linear, more or less inflexed and concave; pygidium nitidous between the large sparse punctures; (Riverside County, California). *jurumpa* Pate

Clypeus with the median lobe narrower, the distal width not more than twice the length of the distance measured from the discal tubercle to a line drawn between the distolateral angles; clypeal bevel, if concave, not strongly nor distinctly inflexed; pygidium more or less opaque and with a fine microscopic reticulate or favose aciculation between the large coarse punctures....................29

29. Front with an impressed median longitudinal line from the anterior ocellus; postocellar distance two and one-half times the ocellocular line; posterior emargination between the squamae obtusely angulate; (San Francisco Bay region; California)..............*franciscus* Pate

Front without an impressed line; postocellar distance three times the length of the ocellocular line; posterior emargination between the squamae narrower, acutely angulate 30

30. Clypeal bevel strongly concave and sharply margined dorsally; discal areole of posterior face of propodeum well defined; middle and hind tibiae quite strongly spined; (Owens Valley, California). *serrano mono* Pate

Clypeal bevel relatively flat, not strongly concave and if margined dorsally, not sharply so; discal areole of posterior face of propodeum poorly defined or almost obsolete; middle and hind tibiae not as strongly spined; (Transverse Ranges district, central southern California)......................... ....*serrano serrano* Pate

31. Temporal carinae present and well developed below; a low rounded nitidous callosity behind each compound eye; squamae falcate; discal areole of posterior face of propodeum obtrigonal; (New Mexico to southern California); [VIERECKI GROUP].........*vierecki* Pate

Temporal carinae absent; an acute, more or less opaque tubercle behind each compound eye; discal areole of posterior face of propodeum obcuneate 32

32. Squamae slender, falciform; emanating from each dorsolateral angle of discal areole of posterior face of propodeum is an oblique carinule which passes dorsad and bisects the lateral fields of the dorsal face of propodeum; abdominal venter more or less convex; puncturation rather coarse; black, eastern forms; (Virginia); [BRIDWELLI GROUP]. *bridwelli* Pate

Squamae broad, semicircular to subreniform in shape, the apices bluntly acute or truncate; without such oblique carinules emanating from the dorsolateral angles of discal areole of posterior face of propodeum; abdominal venter usually flatter; puncturation generally finer; western forms; [CLADOTHRICIS GROUP]....................33

33. Distance between the antennal sockets subequal to that between them and the nearest eye margin..................................34

Distance between the antennal sockets distinctly longer, usually about twice that between them and the nearest eye margin.............35

34. Squamae semilunate, not strongly incurved behind, the apices bluntly acute; abdominal venter, tergites, and mesonotum coarsely punctate; postocellar line four times the ocellocular distance; scape one-half the length of the eye; (central New Mexico to the Colorado River). *mescalero* Pate

Squamae subreniform, very strongly incurved behind, the apices bluntly truncate; abdominal venter, tergites, and mesonotum finely punctate; postocellar line three times the length of the ocellocular distance; scape one-third the length of eye; (Colorado Desert, California)..*istam* Pate

35. Squamae semilunate, not strongly incurved behind, the apices bluntly acute; abdomen strongly constricted between all the segments, its venter moderately convex; postocellar line three times the length of the ocellocular distance; (San Gabriel Mts., California to the Walla Walla Plateau of Washington)..............*cucamonga* Pate

Squamae strongly incurved behind, the apices broadly rounded or bluntly truncate; abdomen not strongly constricted between all the segments, its venter flat; postocellar line four times the length of the ocellocular line..36

36. Squamae ampliate distad, the apices bluntly truncate and emarginate or notched; clypeus with a tumid campanulate platform terminating in a narrow transverse linear bevel; (Riverside, California). *pachappa* Pate

Squamae not ampliate distad, the apices broadly rounded or if truncate, not notched; clypeal lobe not terminating in a distinct transverse linear bevel..37

37. Vertex, mesonotum and abdomen all more or less opaque and with fine contiguous puncturation; mucro rather stout and broad with the apex more or less truncate; (aestival and autumnal forms of the Transverse Ranges and Coast Ranges northward to the Salinas Valley district of California)....................*cladothricis eriogoni* Pate

Vertex, mesonotum and abdomen more or less fulgid, with fine distinctly separated puncturation; mucro relatively slender..........38

38. Width of front measured at distal end of scapes but one-half the vertical length of eye; (aestival and autumnal forms ranging from central New Mexico to the Mohave Desert of California and thence northward)....................*cladothricis cladothricis* (Cockerell)

Width of front measured at distal end of scapes five-eighths the vertical length of eye; (vernal forms of the Colorado Desert and adjacent regions of southern California).....*cladothricis prosopidis* Pate

Diagnostic Characters of the Species.—In his revision of *Belomicrus*, Kohl enumerates no less than twenty-seven features[2] which he believed important in the diagnosis and differentiation of the species of the genus. On the whole, all these characters have been found of more or less value in the present study, the most important being the structure of the clypeus and the mandibles, the character of the postocular and temporal regions of the head, the shape of the scutellum, the postscutellum, the squamae and the mucro, and, in the males, the structure of the hypopygium and the type of fore coxae, *i. e.* whether simple as in *forbesii* or obliquely sulcate as in *cladothricis*.[3] Kohl suggests that the width of the front measured at its narrowest point, the relation of the distance between the hind ocelli (the postocellar line) to that between them and the nearest eye margin (the ocellocular line), the ratio of the distance between the antennal sockets (the interantennal line) to that between the sockets and the nearest eye margin (the antennocular line), and the relative length of the scape may be of use in the separation of the species.

Measurement and tabulation of these in the North American forms studied indicate that such relative proportional characters have a distinct utilitarian and diagnostic value, particularly in aiding to differentiate closely related species. But, as may be seen by consulting the accompanying table, certain of these proportions, *e. g.* the interantennal-antennocular ratio, are relatively constant throughout any particular group of species examined. The chief usefulness of these proportions therefore lies in the constancy, either absolute or relative, which they display throughout any group of related forms. Except in *secchi*, the interantennal line is either subequal to or greater than the antennocular line. Moreover, the interantennal-antennocular ratio is absolutely constant for all the species of any North American assembly, save the Cladothricis Group in which four species: *istam, tuktum, timberlakei* and *mescalero*, have the distance between the antennal sockets subequal to that between the sockets and the nearest eye margin, while the remaining four forms have the ratio of the interantennal line twice that of the antennocular

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[2] Konowia, II, pp. 17-18, (1923).

[3] Apparently Kohl was not aware of this important character.

Head Ratios in the Nearctic Species of Belomicrus

	Interantennal line	Postocellar line	Length of scape	Width of front at distal end of scapes
	Antennocular line	Ocellocular line	Vertical length of eye	Vertical length of eye
apache	1.5	2.5	.4	.6
vanyume	2	3	.4	.72
f. forbesii	1.5	2.6	.375	.68
f. penuti	1.5	2.5	.375	.625
cookii	1.5	2.5	.375	.643
coloratus	1.5	2.75	.4	.666
querecho	1.5	2.5	.35	.643
cahuilla	1.5	5	.333	.72
s. serrano	2	3	.375	.625
s. mono	2	3	.43	
quemaya	2	2.8	.437	.625
franciscus	2	2.5	.466	.666
jurumpa	2	2.5	.466	.666
vierecki	2	4	.5	.5
sechi	.8	3	.4	.65
c. cladothricis	2	4	.4	.5
c. eriogoni	2	4	.4	.5
c. prosopidis	2	4	.35	.625
pachappa	2	4	.33	.666
cucamonga	2	3	.4	.55
minidoka	2	3	.4	.6
istam	1	3	.33	.6
tuktum	1.1	5	.4	.54
mescalero	1	4	.5	.66
timberlakei	1	3	.4	.7
bridwelli	1.3	3	.4	.625
Mean	1.65	3.25	.4	.625

distance. The remaining three proportions tabulated show no such striking absolute constancy; these ratios are more relative in character and subject to variation within certain limits. The postocellar line is always greater than the ocellocular line and varies somewhat, but is relatively constant throughout the species of any complex with the exception of the Cladothricis Group. The postocellar-ocellocular ratio ranges from two and one-half, as in *apache* and many of the forms of the Forbesii Group, to as high as five in the case of *cahuilla* and *tuktum,* the mean ratio being about three, as in the Vanyume, Sechi, Bridwelli, and many of the forms of the Cladothricis Group. The width of the front, measured at the distal end of the scape,[4] varies from one-half the vertical length of the eye in *vierecki* to approximately seven-tenths that distance in *vanyume, timberlakei, cahuilla* and *forbesii,* the mean ratio being about five-eighths. The length of the scape in relation to the vertical length of the eye displays a certain degree of proportional variation, ranging from one-third the vertical eye length in *cahuilla* to one-half that distance in *vierecki*; the mean ratio in this instance is approximately four-tenths, as in *apache, vanyume, sechi* and the majority of the species of the Cladothricis Group. In certain species groups, particularly the difficult Franciscus complex, the apical width of the median lobe of the clypeus in relation to the median length of the clypeus, or to the distance from the apex of the discal tubercle to the apical margin,[5] has been found to be a very satisfactory and useful character in the separation of the species.

The hind femora in the generalized forms are straight and more or less obterete or fusiform, but in the majority of the North American species, as well as many of the exotic forms, the upper margin is more or less concave and sinuous which gives the legs a curious knock-kneed-bow-legged appearance. Concomitant with this condition, the genicular area of the femora usually becomes sharply keeled distally above and often produced into a sublamelloid carina; this latter is frequently curved backward, more or less arched and incurved apically, resulting in a small fornicate structure.

The mucro of all the known North American forms is entire apically. Usually it is narrow, acuminate and channeled on the dorsal surface, but in *coloratus and forbesii* the mucro is more or less spatulate apically and canaliculate on the ventral surface, while in the atypical form of *cladothricis* it is relatively broad and stout with the apex truncate. In a number of Old World forms such as *persa, braunsii, funestus* and *sordidus* the mucro is quite broad and retuse or distinctly emarginate apically.

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[4] This, rather than the narrowest place as advocated by Kohl, was chosen as the most convenient and easily located point.

[5] When the apical margin of the median lobe is excised, the measurement is taken from the apex of the discal tubercle to a line drawn between the distolateral angles of the median lobe.

All the Nearctic species have the scutellum semicircular and ecarinate medially, although there is a faint trace of a median longitudinal carina in some specimens of *vierecki*. In the Old World, however, many forms have developed a quadrate scutellum with the hind angles dentate, and, in a number, both the scutellum and postscutellum are furnished with a median longitudinal carina. Both of these latter features are clearly derivatives of the former condition. With the exception of *vanyume* and *vierecki,* all the North American species have the prepectus and mesopleura rounded anteriorly; they lack the sharp-edged margin or epicnemium which is such a characteristic feature of many African and Eurasian forms. A large number of Old World species have the humeral angles of the pronotum dentate, or the anterior dorsal margin carinate or strongly margined anteriorly, but the pronotum of the Nearctic forms is edentate and rounded anteriorly and laterally, save in *vanyume* which has a vertical carina descending from each humeral angle.

The Nearctic montane form *forbesii penuti* is remarkable for the development of a peculiar pocket-like invagination on the mesothoracic epipleura; a comparable structure is present on the dorsal margin of the metapleura of the South African form *braunsi*. In the former, the pocket is situated beneath the fore wing base and opens ventrally, while in the latter it lies beneath the base of the hind wings and opens dorsally. In both cases, the structure appears to have resulted from a proliferation and great development of a carinule in each region. What function, if any, the structure serves is problematic. It might be interpreted as an acarid chamber, comparable perhaps to those on the thorax and abdomen of several African species of *Nortonia,*[6] but none of the material of *Belomicrus* examined has been found to be infested with acarids.

The various other specific features are quite fully discussed in the following sections on the subgenera, series and species groups, and ethology.

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[6] *Cf.* Bequaert, Bull. Amer. Mus. Nat. Hist., xxxix, pp. 94, 97-99, 102-107, figs. 81, 93, 95, (1918).

Subgenera.—Since the establishment of the genus *Belomicrus* by A. Costa in 1870, various authors have proposed six names for presumed discrete generic segregates of, or subgeneric entities within it, or for groups which have since proven to be congeneric with the genus in the broad sense. Radoszkowski in 1877, probably unaware of Costa's genus, erected *Oxybeloides*[7] for his strange Transcaspian form *fasciatus*; this has since proven to be congeneric with *Belomicrus* in the broad sense. In 1896, Brauns proposed the genus *Oxybelomorpha*[8] for the reception of those species of *Belomicrus* in which the mandibles are emarginate beneath, but subsequent authors have usually treated this as merely a subgenus at most. Arnold, in 1927, in his monograph of the South African Sphegidae, established the subgenera *Nototis*[9] and *Brimocelus*,[10] the latter of which I recently raised to full generic status.[11] Finally, in 1932 Gussakovskij proposed *Pseudoxybelus*[12] for his interesting and curious new Iranian species *persa*. All of these groups have as one of their basic features an emarginate condition on the lower mandibular margin.

Practically all authors have hitherto been more or less in accord in recognizing at least two groups within the genus *Belomicrus*: first, the typical group in which the lower margins of the mandibles are entire, and secondly, those forms having the mandibles excised, for which Brauns' name *Oxybelomorpha* has been customarily employed. Indeed, until now I have been inclined to accept this division, albeit with certain misgivings and reservations. But the recent discovery in southern California of *Belomicrus cahuilla*, and in New Mexico of *B. querecho*, has furnished evidence sufficiently suggestive to indicate that the customary and traditional method of subdividing the genus is probably untenable and certainly unnatural. In both *cahuilla* and *querecho* the mandibles are distinctly emarginate beneath, but the closest affinities of each of these species and their Old World relatives obviously lie with Nearctic and Palaearctic forms in which the mandibles are entire. Moreover, a critical analysis of certain South African and other Old World species hitherto assigned to *Oxybelomorpha* has likewise revealed that their closest relationships are with other Old World or Nearctic species in which the mandibles are entire. A careful comparison of forms having the mandibles excised beneath with those in which the lower mandibular margin is entire has produced no positive evidence of any correlated characters that would support a fracture of the genus upon such a feature. Instead, it has merely demonstrated the existence of forms like *forbesii* which exhibit an intermediate type of excision. Consequently, as in the case of the Miscophine *Solierella-Lautara-Silaon-Niteliopsis* tangle[18] which closely parallels the present situation, any attempt to subdivide *Belomicrus* upon the basis of a single character, such as the structure of the mandibles, must succumb to a recognition of the fact that only by employing several more or less closely interrelated features may the various degrees of affinity within the genus be definitely determined and naturally expressed.

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[7] Fedtschenko: Reise in Turkestan, II, Sphegid, p. 68, (1877).

[8] Ann. K. K. Naturhist. Hofmus, Wien, XI, p. 475, (1896).

[9] Ann. Transvaal Mus., XII, p. 64, (1927).

[10] Ann. Transvaal Mus., XII, p. 62, (1927).

[11] Mem. Amer. Ent. Soc., no. 9, p. 14, (1937); *v. et.:* Philippine Journ. Sci., LXIV, p. 376, (1938); and Trans. Amer. Ent. Soc., LXVI, pp. 9-11, (1940).

[12] Trav. Inst. Zool. Acad. Sci. URSS, I, p. 266, (1932); *v. et.:* Mem. Amer. Ent. Soc. no. 9, p. 56, (1937), and Philippine Journ. Sci., LXIV, p. 376, (1938).

A detailed analysis of the North American forms indicates that the shape of the postscutellum and the position and shape of the squamae is usually correlated with congeries of other morphological features, such as the presence or absence of a pygidium and sulcate fore coxae in the males, and, in both sexes, of a groove on the basal half of the first abdominal tergite and the presence or absence of postocular tubercles, as well as various other characters. Application of these criteria to such Old World material as I have had before me confirms in a certain measure the evidence adduced by the Nearctic species, and indicates without measure of doubt that any division of the genus must take these features into account. Yet, I am loath at the present juncture to propose any fracture of *Belomicrus* into subgenera upon the characters just given above, particularly inasmuch as I have seen as yet only approximately one-third[14] of the twenty-eight described Old World forms, the descriptions of which are usually inadequate and often misleading. Instead, as may be seen by consulting the following section, I propose for the present to divide the genus into merely a number of species groups. In fact, it is not at all unlikely that, when all the Old World species are studied in the light of the evidence presented in these pages, it will be found impossible to separate the genus satisfactorily into subgenera; *Belomicrus*, like its larger ubiquitous relative *Oxybelus*, gives every appearance of being an extremely intricate mosaic of interdigitated groups of species.

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[18] *Cf.* Mem. Amer. Ent. Soc., no. 9, p. 59, footnote 209, (1937). Although it is a simple matter to separate the females of *Solierella* (*s.lat.*) from those of *Plenoculus*, no wholly satisfactory character has hitherto been pointed out by which the males of these two genera may be distinguished. I have found that the males of *Solierella* (including *Lautara, Silaon* and *Niteliopsis*) have the fore coxae sulcate as in many of the Viereckì Series of the present genus, while in *Plenoculus* the fore coxae of the males are simple and entire as in all those of the Forbesii Series of *Belomicrus*.

If, however, it eventually proves feasible to divide *Belomicrus* into discrete subgenera, Radoszkowski's group *Oxybeloides*, which is distinguished from all the other members of the genus by the absence of a mucro, may be recognized as a natural subgeneric entity. On the other hand, Gussakovskij's subgenus *Pseudoxybelus* is probably quite untenable under any circumstances. Although I have seen no material of the group, nevertheless, the diagnostic characters Gussakovskij cites and illustrates as distinctive features of *Pseudoxybelus* are not in my estimation of sufficient magnitude to warrant his Iranian form *persa* being accorded the rank of a discrete subgenus, inasmuch as these characters are likewise displayed by such South African species as *Belomicrus kohlii* and *B. braunsii* which constitute the typical group to which Brauns' name *Oxybelomorpha* must be applied. So far as I am aware, the only essential character wherein *Pseudoxybelus* differs from *Oxybelomorpha* is the semicircular scutellum; in the latter group the scutellum is quadrate with the hind angles dentate. Notwithstanding this significant difference, I consider it advisable at the present state of our knowledge to regard *Pseudoxybelus* as merely a synonym of *Oxybelomorpha*.[15]

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[14] Of the twenty-eight described Old World species of *Belomicrus*, I have had an opportunity to study the following nine forms: *antennalis* Kohl, *braunsii* Kohl, *caesariensis* Pate, *ferneri* Kohl, *modestus* Kohl, *obscurus* Kohl, *odontophorus* Kohl, *parvulus* Radoszkowski (=*femoralis* Kohl), and *rhodesianus* Arnold.

[15] *Cf.* fuller discussion of this point in the following section on Series and Species Groups.

Arnold's peculiar monobasic South African subgenus *Nototis,* to which he has recently added another species, is unknown to me in nature and I cannot venture any conclusions here as to its validity. In accordance with my present views, I have reduced it in rank in the following section to that of merely a species group.[15]

Series and Species Groups.—Arranging the North American species of *Belomicrus* in species groups which appear to be natural, it becomes evident at once that there are two distinct divergent stocks represented in the Nearctic region. These aggregates for the purpose of convenience, I have chosen to call series; each embraces several species groups which, together with their component species, are as follows:

FORBESII SERIES

Apache Group	*apache* Pate
Vanyume Group	*vanyume* Pate
Forbesii Group	*forbesii forbesii* (Robertson)
	forbesii penuti Pate
	cookii Baker
	coloratus Baker
Querecho Group	*querecho* Pate
Cahuilla Group	*cahuilla* Pate
Franciscus Group	*serrano serrano* Pate
	serrano mono Pate
	quemaya Pate
	franciscus Pate
	jurumpa Pate

VIERECKI SERIES

Viereckі Group	*vierecki* Pate
Sechi Group	*sechi* Pate
Cladothricis Group	*cladothricis cladothricis* (Cockerell)
	cladothricis criogoni Pate
	cladothricis prosopidis Pate
	pachappa Pate
	cucamonga Pate
	minidoka Pate
	istam Pate
	tuktum Pate
	mescalero Pate
	timberlakei Pate
Bridwelli Group	*bridwelli* Pate

This arrangement has been based upon a comparative analysis of a dozen or more characters in all the species. Among these various features, the most important are the shape of the scutellum and postscutellum, the structure, shape and position of the squamae and mucro, the character of the first abdominal tergite and the postocular and temporal regions of the head, and, additionally in the males, the structure of the fore coxae, the ultimate abdominal tergite and the hypopygium. Naturally, any linear sequence of forms such as given above possesses certain limitations, particularly in tending to mask to some extent what appear to be the proper phylogenetic order of the species. The Forbesii Series clearly represents one line of development, and the Vierecki Series another divergent stock, both having arisen in all probability from some primitive ancestral form of the general basic nature of *apache*.

The following remarks pertain primarily to the Nearctic forms of *Belomicrus*; but I have endeavoured to incorporate in the ensuing discussion, either in what I believe to be the proper place in the phyletic scheme or at the end of each series, such information as is available relative to the affinities of the various Old World species to these forms. In many cases, however, these must be regarded as merely suggestive comments, often quite tentative in nature, and in nowise conclusive, inasmuch as I have seen only a few of the forms discussed.[16] Many of these Old World species are known from but one sex, often only from the unique type, and frequently are inadequately described and figured. Nevertheless, I have the temerity to offer here the results of my study of them, interpreted in the light of the evidence presented by the Nearctic species, in the hope that my remarks may be of assistance to whoever may work upon the Old World fauna of this group.

The Forbesii Series in North America comprehends thirteen discrete species and subspecies distributed among six distinct species groups. The assemblage as a whole is characterized by the semicircular ecarinate scutellum, the hind angles of which are rounded and not prominent nor dentate, and the trigonal to sub-

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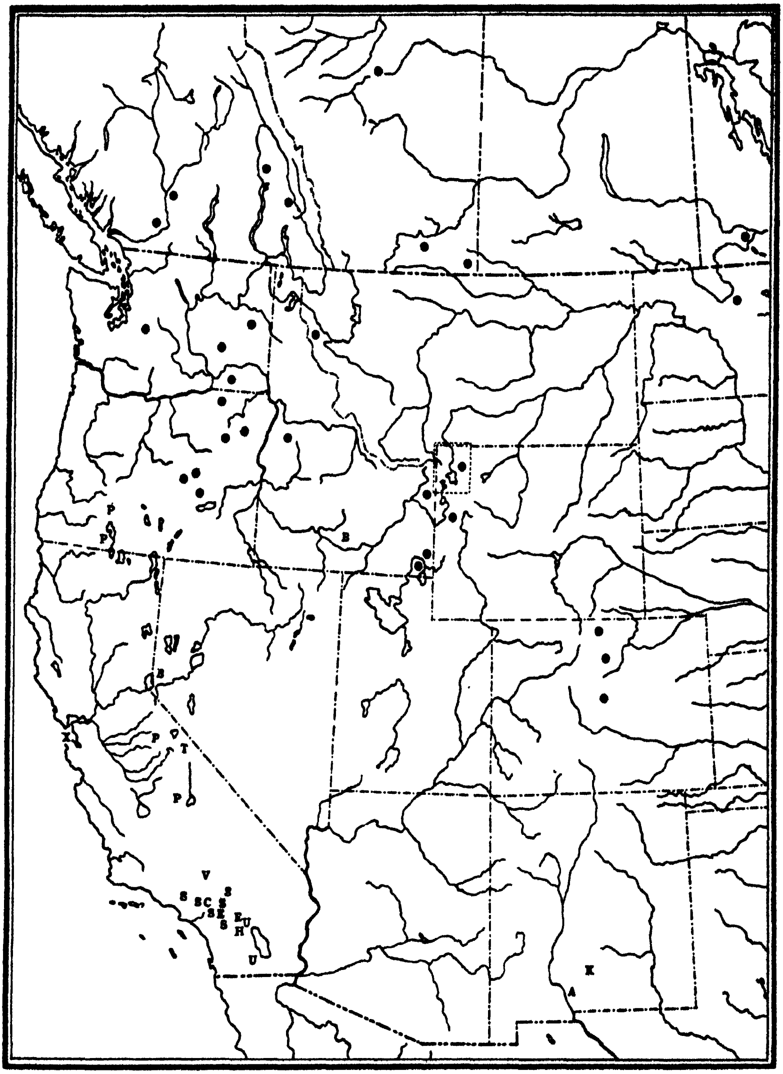
[16] *Cf.* footnote 14 on a preceding page.



Text-figure 1. Map of the western United States and Canada showing the distribution of the species and subspecies of the Forbesii Series. A, *Belomicrus apache*; B, *B. coloratus*; C, *B. cookii*; E, *B. jurumpa*; H, *B. cahuilla*; K, *B. querecho*; ●, *B. forbesii forbesii*; P, *B. forbesii penuti*; S, *B. serrano serrano*; T, *B. serrano mono*; U, *B. quemaya*; V, *B. vanyume*; X, *B. franciscus*.

trapeziform postscutellum with the squamae more or less subrectangular in shape and situated obliquely along the entire length of its posterior margin so that they are more or less contiguous posteriorly. Moreover, except in the Apache and Vanyume Groups, the squamae are large and translucent, and in addition, save in the Querecho and two aforementioned groups, are traversed by fine subparallel carinulae. The first abdominal tergite generally lacks a deep distinct median longitudinal groove or furrow on its basal half, while the males of all the forms known have the fore coxae simple and the last abdominal tergite usually without a distinct pygidial area. In contrast to the species of the Vierecki Series, the forms of the present complex display no marked tendency toward the development of postocular tubercles, while the discal areole of the posterior propodeal face is often poorly demarcated if not obsolescent.

The preponderance of evidence, both morphological and distributional, indicates that the present series is without question the more generalized of the two phratries now inhabiting North America. The phyletic pattern of the complex is a simple arborescent type; there is no interesting interdigitation of features such as is evident in the Vierecki Series. The Apache Group on the whole represents the most generalized, and the Franciscus the most specialized assemblage. As may be seen by consulting the accompanying map (Text-fig. 1), the distribution of the present complex in North America is distinctly more widespread, and in particular more northern, than that of the Vierecki Series.

The Apache Group, composed of merely the nominate form, is known as yet only in the female sex, and consequently any generalizations as to its proper phyletic position may be somewhat premature at the present juncture. Nevertheless, in its simple alate, ecarinulate, poorly developed squamae, it displays a habitus that bespeaks its fundamentally generalized nature. The highly specialized ancoriform clypeus and the greatly developed temporal region, both of which are additional idiocratic features of the group, must be regarded as individual specializations of the complex or of the species, since they in nowise detract from the essential fact that *apache* is indubitably the most primitive existing form of the genus known in North America, if not the world at large. The species gives every evidence of being a somewhat sidewise specialized peripheral relict of that ancestral stock from which the Forbesii and Vierecki Series arose, and also, in all probability, a representative of the genetic stock in which the various Old World groups and species of the present genus may very well have had their origin.

The Vanyume Group has in its single species a readily recognized combination of features, none of which are found in any other form of the western hemisphere. The triquetral fore femora, the vertically carinate lateral angles of the pronotum, the translucent laminate anterior margin of the prepectus and mesopleura and the dentate mesosternum are indubitably specialized characters peculiar to the species, yet the simple clypeus, the large broad and heavy unspecialized mandibles, and the simple fenestrate but ecarinulate squamae indicate that it is a rather generalized form. Like *apache,* the sole representative of the present group is known only from the female sex, which renders doubly difficult the allocation of this entity to its proper phylogenetic position. It is apparently a somewhat sidewise specialized representative of the same generalized stock from which arose the Forbesii Group, where lie its closest affinities, albeit rather remote.

The Forbesii Group is a widespread complex of four rather closely related North American forms, differentiated from the other Nearctic species of the series by the discally tumid clypeus with the apical margin of the median lobe truncate to convexly arcuate, by the mandibles being entire to subemarginate beneath and provided with a small obtuse tooth medially on the inner margin, and by the transversely carinulate squamae. In all the component species, the distance between the antennal sockets is one and one-half that between them and the nearest eye margin; the postocellar distance varies from two and one-half to two and three-fourths the ocellocular distance; the length of the scape ranges from three-eighths to four-tenths the vertical length of the eye; and the width of the front varies from five-eighths to a little more than two-thirds (.68) the length of the eye. Furthermore, in the males the fore tarsi are furnished with a distinct though sometimes inconspicuous pecten, while the ultimate abdominal tergite is usually without any trace of a pygidial area, and the hypopygium is flat, nitidous and glabrous throughout with the apex entire and broadly rounded. Two of the forms, *cookii* and *forbesii*, have the postocular region of the head angulate to subtuberculate; with the exception of *querecho*, this is the only occurrence in the Forbesii Series of a feature which is such a universal characteristic of the Nearctic species of the Vierecki complex. Both *cookii* and *forbesii* have the mandibles subemarginate beneath, foreshadowing one of the most distinctive features of the Querecho and Cahuilla Groups. The montane form, *Belomicrus forbesii penuti*, is notable for the development of a peculiar pocket-like structure on the mesothoracic epipleura; this is somewhat analogous to that borne on the metapleura of the South African species, *B. braunsii*.

The Forbesii complex is a relatively vagile group of species, largely northern in distribution. It represents, in certain measure, the counterpart and complement of the similar large but in general more southernly distributed Cladothricis Group of the Vierecki Series. The typical species of the present assemblage is not only the most widespread form of the genus in North America, but it likewise evidently possesses a greater tolerance of ecological and climatic conditions than any of its Nearctic congeners, ranging from the Sonoran Zones of the northwestern United States well into the Canadian Zones of British Columbia and Alberta.

In the Mediterranean and Eremian regions of the Old World, the Forbesii Group has a number of close relatives, notably *antennalis*, *parvulus*, *modestus*, and *obscurus*. Of these, *parvulus*[17] and *antennalis*[18] agree most closely with the group as here understood, possessing all the characteristic features of it; *modestus*[19] and *obscurus*,[20] while closely related, nevertheless, disagree with the present concept of the complex in that the squamae are not transversely carinulate, the fore tarsi of the males lack a pecten and a weak pygidial area is discernible on the ultimate abdominal tergite, while traces of an epicnemium are visible on the prepectus. The first two species may be easily included in the Forbesii Group without doing a violence to recognized taxonomic concepts; but the latter two forms, and likewise in all probability, the Baluchistan species, *B. meyeri*[21] also, might be regarded as a discrete group somewhat intermediate between the ancestral *forbesii* stock and the following Querecho Group.

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[17] *Oxybelus parvulus* Radoszkowski [in Fedtschenko], Reise in Turkestan, II, Sphegid, p. 70, no 3, pl. VIII, fig. 6, (1877); [♂, ♀; TURKESTAN] — Radoszkowski, Bull. Soc. Nat. Moscou, (N. S.), V, p. 592, pl. XXIII, fig. 73, (1891); [♂; genitalia]. *Belomicrus femoralis* Kohl, Ann. K. K. Naturhist. Hofmus., Wien, XIV, p. 314, pl. XIX, figs. 2, 11, (1899); [♀; TURKESTAN: Tscharada]. *Belomicrus parvulus* Kohl, Konowia, II, p. 198, figs. 7, 18, (1923); [♀, ♂; TURKESTAN: Tscharada. TRANSCASPIA [Turkmenistan]: Great Balchan].

The close morphological relationship of the Nearctic *forbesii* and its allies to the Eurasian *parvulus* and *antennalis*, and the wide and peripheral type of distribution displayed by each, is presumptive evidence that the North American forms or their immediate ancestors had their origin in the Old World and probably reached this continent by way of the former Siberian-Alaskan land bridge during some preglacial or interglacial period.[22]

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[18] *Belomicrus antennalis* Kohl, Ann. K. K. Naturhist. Hofmus., Wien, xiv, p. 314, pl. XIX, fig. 15, (1899); [♂ Russia: Sarepta [*i.e.* Krasnoarmejsk]. Lower Austria: Marchfeld].—Kohl, Konowia, ii, p. 196, fig. 21, (1923); [♂].

[19] *Oxybelus* (*Oxybeloides*) *modestus* Kohl, Ann. K. K. Naturhist. Hofmus., Wien, vii, p. 206, pl. III, fig. 11, (1892); [♂, ♀; Azerbaijan: Araxesthal [*i.e.* valley of the Aras R.]. *Belomicrus modestus* Kohl, Konowia, ii, p. 200, fig. 11, (1923).

[20] *Oxybelus* (*Oxybeloides*) *obscurus* Kohl, Ann. K. K. Naturhist., Hofmus., Wien., vii, p. 207, pl. XIII, fig. 21, (1892); [♀; Greece: Corfu]. *Belomicrus obscurus* Morice, Trans. Ent. Soc. London, 1911, p. 133, [Algeria: Bône; visiting *Sedum coeruleum*]. — Kohl, Konowia, ii, p. 267, (1923); [♀, ♂; Greece: Corfu; Cephalonia; Athens. Palestine: Jericho. Algeria: Oran. Lower Austria: Melk]. From the collection of the Vienna Museum, I have seen the following unrecorded material: 1♀; Dalmatia: Gravosa; July, 1914; (F. Maidl). 1♂; Tunisia: Tunis; May; (DeGraeffe).

[21] *Belomicrus Meyeri* Kohl, Konowia, ii, p. 260, fig. 12, (1923); [♂; Baluchistan: Quetta].—Pate, Philippine Journ. Sci., lxiv, p. 387, (1938).

[22] *Cf.* the section on Distribution for a fuller discussion of this point.

Closely related to, and probably a derivative of, the Eremian and Mediterranean Obscurus complex is the monotypic Querecho Group. Like the following Cahuilla assembly, the mandibles of *querecho* are distinctly excised beneath and the ultimate abdominal tergite is provided with a very strongly demarcated pygidial area. But the remaining diagnostic features of the Querecho complex are a curious intermixture of the characteristics of the preceding Obscurus and Forbesii Groups, agreeing with both in the interantennal-antennocular and postocellar-ocellocular ratios and the structure of the male hypopygium, and with the former assemblage in the shape and structure of the squamae and clypeus, but in the subtuberculate character of the postocular region and the pectinate condition of the male fore tarsi strongly resembling *cookii* and *forbesii* of the latter group. The present group evidently evolved along lines similar to, but independent of, those of *cahuilla,* and in all probability represents an early Eurasian immigrant stock into the New World.

The Cahuilla Group, composed solely of the southern Californian form *cahuilla,* is distinguished by the strongly emarginate mandibles, the absence of a pecten on the fore tarsi of the males, the presence of an indistinct pygidial area on the ultimate abdominal tergite, and the flat to slightly convex and nitidous hypopygium, the apical margin of which is subtruncate and bisinuate. The distance between the hind ocelli is five times that between them and the nearest eye margin; the ratio of the postocellar to the ocellocular line is thus the greatest of any North American form examined with the exception of *tuktum* in the Viereck Series. Ordinarily, the emarginate character of the mandibles would cause this species, as well as the preceding form *querecho,* to be automatically referred to the *Oxybelomorpha* group, but *cahuilla* gives every indication of having arisen from the same ancestral stock as that in which the Forbesii Group had its origin. As I have intimated earlier in this paper under the discussion of the subgenera, the emarginate character of the mandibles is a far from trustworthy criterion for determining the true affinities of a species inasmuch as it tends to separate widely forms that are obviously related.

In the Old World, three Mediterranean and Eremian species: *caesariensis*,[23] *odontophorus*,[24] and *steckii*,[25] agree in general with the present interpretation of the foregoing group, except that the ultimate abdominal tergite is furnished with a rather definite pygidial area and the hypopygium is longer and narrower, with the apical margin simply truncate. They probably represent a discrete group very closely related to the preceding Cahuilla complex.

The Franciscus Group is a compact complex of five closely related Nearctic forms restricted, so far as present records go, entirely to central and southern California. It represents the culmination of the Forbesii line of development in the Nearctic region. The characteristic features of the present group are the discally tuberculate clypeus of which the median lobe is more or less emarginate distally, the entire mandibles provided with a large medial tooth on their inner margins, and the absence of postocular tubercles in any of the component species. All the members of this group have the distance between the antennal sockets usually about twice the length between them and the nearest eye margin. Additionally in the males, the fore tarsi lack any trace of a pecten, the last abdominal tergite sometimes displays rudiments of a pygidial area, and the hypopygium is transversely tumid or gibbous and glabrous and nitidous discally, but punctate and pubescent basally or at the distolateral corners, or both, while the apex is retuse to emarginate. The species of the present complex are apparently rather localized or areally limited in their distribution, and, as a rule, distinctly more xerothermal than those of the Forbesii Group. There are no Old World species that may be assigned to this assembly or that are even remotely allied to it, so far as I know. Indeed, the Franciscus Group gives every indication of being a distinct endemic Sonoran complex which probably had its origin in the same ancestral stock from which the Vanyume Group arose.

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[23] *B*[*elomicrus*] (*Oxybelomorpha*) *caesariensis* Pate, Bull. Soc. Hist. Nat. Afrique du Nord, XXII, p. 113, figs. B, C, (1931); [♂, ♀; ALGERIA: La Guetna; Oran; Biskra].

[24] *Oxybelus* (*Oxybeloides*) *odontophorus* Kohl, Ann. K. K. Naturhist. Hofmus., Wien, VII, p. 205, pl. XIII, figs. 1, 5, 13, 30, (1892); [♀; AZERBAIJAN: Araxesthal (*i.e.* valley of the Aras R.)]. [?] *Belomicrus odontophorus* Morice, Trans. Ent. Soc. London, 1911, p. 133; [ALGERIA: Biskra, on sand among *Cynodon Dactylon* and *Tamarix*]. *Belomicrus* (*Oxybelomorpha*) *odontophorus* Kohl, Konowia, II, p. 190, fig. 3, (1923); [♀, ♂; AZERBAIJAN: Araxesthal. ALGERIA: Biskra].

[25] *Belomicrus* (*Oxybelomorpha*) *Steckii* Kohl, Konowia, II, p. 188, fig. 8, (1923); [♀; "Gallia mer[idionalis] 1897 "].—Berland, Faune de France, X, p. 212, (1925); [♀; southern France].

Two South African species: *ferrieri* and *funestus*, apparently are derivatives of the Forbesii Series. Except that the scutellum is quadrate with the hind angles dentate, these forms agree in all their general features with the foregoing definition of the Forbesii Series. In *ferrieri*,[26] the mandibles are entire beneath, the postocular region not tuberculate, the clypeus is relatively flat throughout with the apical margin of the median lobe truncate and provided with an impressed bevel; the postocellar line is five times the length of the ocellocular distance, and the interantennal distance is subequal to the antennocular line; the prepectus has a weak epicnemium anteriorly; the scutellum is quadrate with the hind angles dentate, and furnished medially with a longitudinal carinule, while the postscutellum is trigonal with the squamae semicircular in shape, placed obliquely and subcontiguous behind, flaring upward but not traversed by transverse carinulae; the first abdominal tergite has a broad shallow impression basally while the last is provided with a more or less distinct pygidial area in the males which have the hypopygium flat and retuse apically, the fore coxae simple and non-sulcate anteriorly and a weak pecten on the fore tarsi.[27] The precise affinities of *ferrieri* are puzzling; at the present juncture, and until further material of Old World species is available for study, I can do no more than tentatively allocate it to a peripheral position in the general Forbesii complex.

So far as I can judge from Arnold's description and figures, *funestus*[28] is rather similar to *ferrieri* except that the lower margins of the mandibles are excised, the squamae subrectangular in shape, the mucro somewhat broader with the apex excised, and the pronotum dentate at the humeral angles as in *kohlii.* I place *funestus* here with some hesitation; it may belong in the Vierecki Series in the neighbourhood of the Kohlii or Braunsii Groups, but

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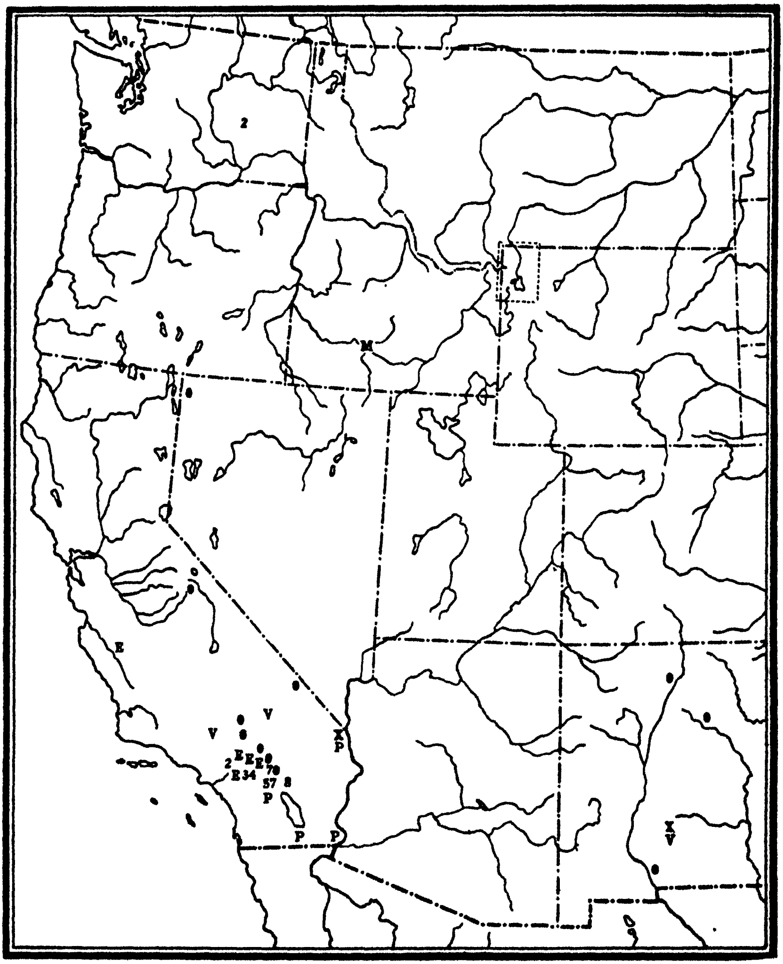
[26] *Belomicrus Ferrieri* Kohl, Konowia, II, p. 265, figs. 2, 17, (1923); [♀, ♂; South Africa, Cape Province: Sunday River]. *B*[*elomicrus*] (*Belomicrus*) *Ferrieri* Arnold, Ann. Transvaal Mus., XII, p. 72, figs. 10, 10a, (1927); [♀, ♂; South Africa, Cape Province: Oudtshoorn; Aliwal North]. —Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

[27] These notes are based on a study of the allotypic male of *B. ferrieri*, from the Sunday River, Cape Province, South Africa.

[28] *B*[*elomicrus* (*Oxybelomorpha*)] *funestus* Arnold, Ann. Transvaal Mus., XIII, p. 411, figs. 45, 45a, (1929); [♀, ♂; South Africa, Cape Province: Van Rhyns Dorp].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

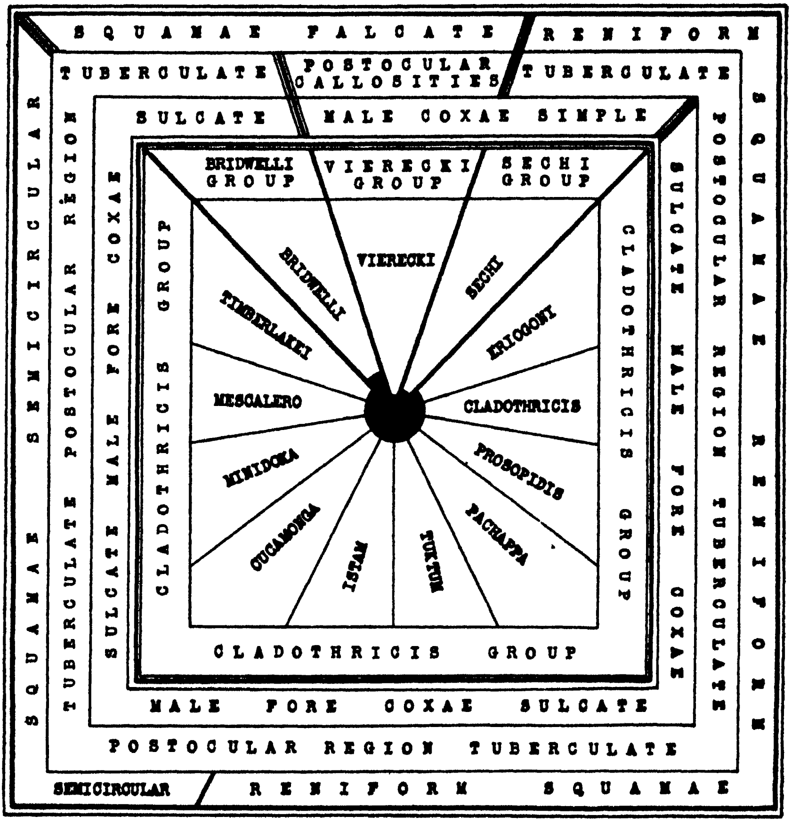


Text-figure 2. Map of the western United States showing the distribution of twelve forms of the Vierecki Series. 2, *Belomicrus cucamonga*; 3, *B. pachappa*; 4, *B. timberlakei*; 5, *B. sechi*; 7, *B. istam*; 8, *B. tuktum*; M, *B. minidoka*; V, *B. vierecki*; X, *B. mescalero*; E, *B. cladothricis eriogoni*; P, *B. cladothricis prosopidis*; ●, *B. cladothricis cladothricis.*

if so, then the shape of the postscutellum and squamae is rather unusual for a member of that series.

The Vierecki Series in North America comprises thirteen species or subspecific forms referable to four distinct groups. It is apparently well represented in the Old World, where there are no less than fourteen described species that may be either assigned to, or represent derivatives of it. The present series is distinguished by a distinctive combination of diagnostic features. As in the Forbesii Series, the scutellum of the Nearctic forms of the Vierecki complex is semicircular and usually ecarinate; but in sharp contradistinction to the trigonal postscutellum of the foregoing series, that of the present assembly is transverse, linear and subrectangular with the squamae situated laterally, and thus widely separated at base and never enclosing the postscutellum behind. Moreover, the squamae are flat and not transversely carinulate, and vary in shape from semicircular through semilunate to either subreniform or falciform; the first type probably represents the most generalized condition. In all the North American species of the Vierecki Series, there is some form of postocular armature, either polished callosities as in *vierecki*, or distinct tubercles as in the remaining forms, while the first abdominal tergite is almost invariably furnished with a distinct median longitudinal groove or furrow on the basal half; this latter feature is usually more evident in the males than in the females. The discal areole of the posterior propodeal face is always distinct and without exception defined by distinct carinules, in sharp contrast to many members of the foregoing series in which the limits of the areole are often indefinite, if not altogether obsolete. The males, furthermore, have a subquadrate or rectangular pygidial area on the ultimate abdominal tergite, and, in all but the Vierecki and Sechi Groups, are provided with a broad oblique sulcus on the fore coxae.

The origin of the Vierecki Series is a moot point. I am inclined to believe that it arose from an ancestral Forbesiioid stock of the general basic nature of *apache*, from which, by a series of successive stages, the posterior median emargination or notch between the squamae became progressively deeper and broader, causing the squamae to migrate sideward and assume a lateral position and a more or less semicircular shape. Concomitant with this migration of the squamae came a transverse stress on the postscutellum, resulting in the attenuated subrectangular type characteristic of this series. The other diagnostic features of the complex may be interpreted as concurrent developments of the foregoing.



Text-figure 3. Diagram of the North American species groups of the Vierecki Series, showing the interdigitation of specific characters.

The thirteen Nearctic forms which comprise the present series may be arranged in four natural groups based primarily upon the character of the postocular region and the male fore coxae, and the shape of the squamae. Correlated with these features are a number of additional characters which will be found in the following discussion of the individual groups and their component species. These four groups of species, while distinct from one another, nevertheless, in their diagnostic features display a curious and interesting mode of interdigitation which has been graphically portrayed in the accompanying diagram (Text-fig. 3). The probable degree of specialization of each group is expressed by the relative length of the radius of the black central portion; the Vierecki Group thus represents the most generalized complex and the Bridwelli the most specialized.

The distribution of the twelve western forms of the Vierecki Series is given on the accompanying map (Text-fig. 2); the thirteenth, *bridwelli*, is known only from the piedmont of north-central Virginia. With the exception of the southern Idaho form *minidoka*, and the Washington record of *cucamonga*, none of the species of this general complex are known at present north of the thirty-seventh parallel; this is in sharp contrast to the distribution of the Forbesii Series, the nominate form of which ranges as far north as the fifty-second parallel in British Columbia, and the fifty-fourth in central Alberta. Save for *cladothricis eriogoni*, all the species of the Vierecki Series are apparently quite xerothermal. The present gap in the distribution of certain forms of this general complex in the region of the Great Basin, the Colorado Plateaux, and the Arizona Highlands is undoubtedly due to insufficient collecting of these tiny forms in those areas.

The Vierecki Group displays through the medium of its sole representative a combination of features which readily separate it from all the other assemblies, at least in North America. The postocular region of the head is furnished with an elongate low nitidous callosity and the temporal carinae are present and well developed throughout, while the discal areole of the propodeum is broadly obtrigonal; none of these characteristics are exhibited by any of the other Nearctic forms of the present series. In addition, the squamae are falcate and the fore coxae of the males are simple, agreeing in the former feature with the Bridwelli Group and in the latter with the Sechi Group. Notwithstanding such specialized characters as the well developed temporal carinae and the falciform squamae, the Vierecki Group gives every evidence of being the most generalized complex of the Vierecki Series in

North America. Certain forms of the eastern hemisphere such as *schulthesii*, *waterstonii* and *minutissimus* may be Old World representatives of this complex; some comments on these will be found at the end of the discussion of the Nearctic forms of this series.

The Sechi Group, composed solely of *sechi*, is somewhat puzzling, showing as it does certain features such as the subreniform squamae, the acute postocular tubercles, and the absence of temporal carinae which are characteristic of the Cladothricis Group, yet at the same time displaying simple non-sulcate fore coxae in the males as evidence of its relationship with the Vierecki Group. However, in the strongly swollen and angustate antennal scapes and in the extraordinarily short interantennal line, which is but eight-tenths the antennocular distance, the present group is distinctive and unique. It probably represents an osculant entity between the Vierecki and the Cladothricis Groups.

The Cladothricis Group comprises a rather closely knit series of ten western and southwestern forms with a number of distinctive features in common. The head is furnished with acute postocular tubercles, the fore coxae of the males have an oblique sulcus anteriorly, the temporal carinae are wanting, and the discal areole of the posterior propodeal face is obcuneate. The squamae vary in shape from semicircular, as in *timberlakei* and *mescalero*, to the reniform type found in the nominate species and *pachappa*. The interantennal-antennocular ratio is likewise variable, and on this basis the complex might be divided into two subgroups: *istam*, *tuktum*, *mescalero* and *timberlakei* in which the interantennal line is subequal to the antennocular distance, and *cladothricis*, *pachappa*, *cucamonga*, and *minidoka* in which the interantennal distance is twice the length of the antennocular line. But the protean shape of the squamae, and the variable length of the postocellar distance, as well as other characters, preclude such a fracture. Like the Forbesii Group, which may be regarded as its counterpart and complement in the Forbesii Series, the Cladothricis complex is a relatively vigorous and vagile stock, largely southwestern in distribution; three of its forms: *cladothricis*, *mescalero*, and *cucamonga*, have a rather wide range, as may be seen by consulting the appended map (Text-fig. 3). The Cladothricis Group is in all probability a development out of the ancestral stock which gave rise to *sechi*.

The Bridwelli Group, made up solely of the typical species, is curious and interesting in a number of respects. Its close relationship with the Cladothricis complex is attested by the presence of a number of identical features, such as the acute postocular tubercles, the sulcate fore coxae of the males and the absence of temporal carinae. On the other hand, the squamae are distinctly falciform as in the Vierecki Group, but this is presumably merely a case of convergence rather than evidence of close relationship. Furthermore, the abdominal sternites are distinctly convex with the tergites rather weakly inflexed at the sides, and the postscutellum, while transversely subrectangular, at the same time has its posterior margin produced medially into a short obtuse shelf-like lobe overhanging the base of the mucro. Finally, the discal areole of the posterior face of the propodeum has emanating from each dorsolateral angle an oblique carinule which passes dorsad and bisects the lateral fields of the dorsal face of the propodeum. None of these three latter features is displayed by any other North American member of the Vierecki Series, although rudiments of the last are suggested in certain species of the Cladothricis Group. The sole species inhabits the piedmont of north-central Virginia and is the only Nearctic representative of *Belomicrus* known as yet east of the hundredth meridian. On the basis of the present data, I believe *bridwelli* to be a relict form long dissociated from its southwestern relatives as a result of the southward migration of the glaciers during the Pleistocene.

The Old World possesses a number of species which either belong in the Vierecki Series, constitute one or more phratries that are more or less closely allied to it, or which represent derivatives of it. In general, they lack the postocular armature so characteristic of the Nearctic forms of this general complex; on the other hand the mandibles of a great majority of these species are excised beneath, while the scutellum of a number has become quadrate in shape with the hind angles dentate. The absence of postocular tubercles may be interpreted as a primitive or generalized condition, whereas there can be no question but what the latter two characters must be regarded as specializations peculiar in large measure to the Old World forms.

Three Mediterranean, Eremian and South African forms: *schulthessii*,[29] *waterstonii*[30] and *minutissimus*,[31] agree in all particulars with the present concept of this series except that the postocular region of the vertex is simple. I know these forms merely from the literature and so cannot state with any certainty their proper phyletic position. The shape of the squamae, the scutellum and postscutellum is evidently similar to that of both the Vierecki and Bridwelli Groups, but the structure of the fore coxae of the males is unknown at the present moment. If these members upon examination prove to be simple and nonsulcate as in *vierecki*, these species may represent the generalized stock from which the Vierecki Series arose.

Except that the mandibles are excised beneath, as in all the following species, the Tunisian form *kohlianus*[32] apparently agrees with the preceding three species in all essential respects. Schulthess in his remarks on *kohlianus* states that it is intermediate in character between *steckii* and "*odontomorphus*" (sic; i. e. *odontophorus* Kohl), but differs from both in size, colouration, sculpture, and the structure of the clypeus, postscutellum and squamae. In view of the last two characters, which he has figured, I have placed *kohlianus* tentatively in the present position rather than referring it like *steckii* and *odontophorus* to the Forbesii Series.

The Iranian form *persa*,[33] for which Gussakovskij proposed the subgenus *Pseudoxybelus*, displays the general characteristics of the Vierecki Series. As I have pointed out in the foregoing discussion of the subgenera, it is hardly worthy of subgeneric rank; it probably represents nothing more than an annectant species group between the preceding assemblages and the following Oxybelomorphoid complex. According to the description and figures, *persa* agrees with the South African forms *braunsii* and *kohlii* in the structure of the legs and the excised inferior mandibular margin; with the former it shares a dentate pronotum, and with the latter, a broad retuse or emarginate mucro, differing from both, as well as all the species that follow, in having the scutellum semicircular rather than quadrate in shape, and thus attesting its relationship, albeit somewhat remote, to the preceding phratries. Gussakovskij apparently considered the broad semilunate fore femora and the strongly bowed and apically fornicate hind femora quite a distinctive feature of *persa*; but these are types that occur sporadically throughout the genus, often in forms quite unrelated to one another.

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[29] *Belomicrus Schulthesii* Kohl, Konowia, II, p. 261, fig. 4, (1923); [♂; TRANSCASPIA [Turkmenistan]: Bala-Ichem].

[30] *Belomicrus Waterstonii* Kohl, Konowia, II, p. 263, figs. 14, 23, (1923); [♀; "Nr. Jerisheh m. N. E. of Jaffa, Palestine"].

[31] *Belomicrus* [*Belomicrus*] *minutissimus* Arnold, Occas. Pap, Rhodes. Mus., no. 5, p. 31, figs. 25, 25a, (1936); [♀, ♂; S.-W. AFRICA: Aus.].

[32] *B*[*elomicrus*] (*Oxybelomorpha*) *kohlianus* Schulthess, Konowia, V, p. 158, figs. 8, 9, (1926); [♀; TUNISIA: Kairouan].—Schulthess, Bull. Soc. Hist. Nat. Afrique Nord, XVII, p. 219, (1926); [♀].

[33] *B*[*elomicrus*] (*Pseudoxybelus*) *persa* Gussakovskij, Trav. Inst. Zool. Acad. Sci. URSS, I, p. 286; pl. I, figs. 4, 5; pl. II, fig. 19; (1932); [♂; PERSIA: Kirman].

The Levantine form *moricei*[34] is seemingly closely related to *persa*, agreeing with it in the structure of the mandibles, the pronotum, the scutellum and postscutellum, as well as the squamae and mucro.

Two South African species: *rhodesianus*[35] and *turneri*,[36] form a small but distinctive group characterized by the quadrate scutellum of which the hind angles are dentate, and by the transverse rectangular postscutellum with the squamae falcate and lateral in position. In both, the mucro is acuminate and the mandibles are strongly excised beneath; the prepectus is furnished with a strong epicnemium anteriorly, and a sulcus is discernible on the basal half of the first abdominal tergite. Moreover, the males possess a distinct quadrangular pygidial area on the ultimate tergite, and the fore coxae are furnished with a strong oblique sulcus. Thus, except for the lack of postocular tubercles, the shape of the scutellum, and the excised mandibles, of which the last two are specialized characters, these species exhibit features characteristic of the majority of the North American forms of the Vierecki Series and consequently may be regarded as logical derivatives of the generalized stock which gave rise to that complex as well as the Old World Schulthessii and Kohlianus Groups.

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[34] *Belomicrus* (*Oxybelomorpha*) *Moricei* Kohl, Konowia, II, p. 192, (1923); [♀; PALESTINE: Jaffa].

[35] *B*[*elomicrus*] (*Oxybelomorpha*) *rhodesianus* Arnold, Ann. Transvaal Mus., XII, p. 65, figs. 4, 4a, (1927); [♀, ♂; SOUTHERN RHODESIA: Sawmills].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

I have examined additional material of this species from Matetsi, Southern Rhodesia.

[36] *B*[*elomicrus*] (*Oxybelomorpha*) *Turneri* Arnold, Ann. Transvaal Mus., XII, p. 66, figs. 5, 5a, (1927); [♀, ♂; SOUTH AFRICA, Cape Province: Ceres].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

In its most restricted sense, *Oxybelomorpha* is exemplified by two South African forms: *kohlii,*[37] the genotype, and *rufiventris.*[38] The diagnostic features of the complex are in the main identical with those of the preceding Rhodesianus Group, differing from it chiefly in the structure of the postscutellum and squamae. Indeed, these are somewhat atypical of the Vierecki Series, and I place the species here rather than in the Forbesii complex with some hesitancy.

Closely related to the preceding Kohlii Group is another South African form: *braunsii,*[39] which displays the same general characteristics that typify the Rhodesianus Group. It is distinguished from both the preceding groups chiefly by the trapeziform postscutellum, the shape of the squamae, and the broad mucro which is truncate and retuse apically as in the Persa complex. A very characteristic feature of *braunsii,* and one which has apparently hitherto escaped the eye of previous workers, is the curious pocket-like invagination on the dorsal margin of the metapleura. This is an analogue of a similar structure found on the mesothoracic epipleura of the Nearctic *forbesii penuti,* but unlike that form, the pocket of *braunsii* is directed ventrad and open dorsally. Comparison of Arnold's description and figures of *sordidus*,[40] another South African species, with material of *braunsii*, has revealed no essential difference between the two other than the slightly notched lower mandibular margin of the latter, and I am inclined to believe that *sordidus* may be closely allied to *braunsii*.

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[37] *Oxybelomorpha Kohlii* Brauns, Ann. K. K. Naturhist. Hofmus., Wien, IX, p. 475, (1896); [♀; SOUTH AFRICA: Port Elizabeth]. *Belomicrus* (*Oxybelomorpha*) *Kohlii* Kohl, Konowia, II, p. 184, fig. 1, (1923); [♂; SOUTH AFRICA: Algoa Bay].—Arnold, Ann. Transvaal Mus., XII, p. 68, figs. 6, 6a, 6b, (1927); [♀; SOUTH AFRICA: Port Elizabeth].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

[38] *Belomicrus* [*Oxybelomorpha*] *rufiventris* Arnold, Occas. Pap. Rhodes. Mus., no. 3, p. 30, figs. 24, 24a, (1936); [♂; SOUTH AFRICA, Cape Province: Van Rhyns Dorp]. This may eventually prove to be the opposite sex of *B. Kohlii,* despite Arnold's assertions to the contrary.

[39] *Belomicrus* (*Oxybelomorpha*) *Braunsii* Kohl, Konowia, II, p. 186, fig. 6, (1923); [♀, ♂; SOUTH AFRICA, Cape Province: Willowmore].—Arnold, Ann. Transvaal Mus., XII, p. 69, fig. 7, (1927); [♀, ♂; SOUTH AFRICA, Cape Province: Willowmore; 38 miles east of Ceres, Little Karroo].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930). This species may stand in some collections labelled as "*Belomicrus* (*Oxybelomorpha*) *Handlirschii*", a manuscript name of Brauns.

The two South African species: *bicornutus*[41] and *crassus*,[42] which Arnold places in his subgenus *Nototis*, I know solely through the medium of his descriptions and figures. However, the diagnostic features which Arnold gives as characteristic of *Nototis* do not seem to be of sufficient magnitude, importance, or constancy to warrant this complex being accorded the rank of a discrete subgenus. The species, nevertheless, undoubtedly represent a distinct, though aberrant group, probably related in some fashion to the Vierecki Series, but aside from that their affinities at the present moment are somewhat obscure.

The Transcaspian species *fasciatus*[43] and the Finnish form *borealis*[44] apparently constitute a natural group distinguished from all the preceding ones by the absence of a mucro. This feature caused Radoszkowski to erect the genus *Oxybeloides* for the reception of his strange Chorasmian form *fasciatus*; but as Kohl has shown this species possesses all the diagnostic characters of *Belomicrus* save for the lack of a mucro, and, in his revision of *Belomicrus* in 1923, he accordingly placed it as an "Artengruppe" (*i. e.* subgenus) coördinate in rank with *Belomicroides, Oxybelomorpha*, and *Belomicrus* in the strict sense. I have seen no material of either of the component species of this group, and, although *Oxybeloides* may eventually prove to be a discrete subgenus or even genus when the diagnostic characters of it are better known, nevertheless, such features as may be inferred from the descriptions and figures of Radoszkowski, Kohl, Forsius and Merisuo—(mandibles excised beneath; scutellum semicircular; squamae simple, translucent, ecarinulate, lamellate, alate, lateral expansions of the bow or arc-shaped postscutellum; mucro wanting; males with a quadrate pygidial area on the ultimate abdominal tergite)—do not in my estimation warrant the complex being accorded any taxonomic rank higher than that of a species group. At present the affinities of the group are obscure. Kohl apparently regarded the complex as annectant between *Belomicroides* and *Belomicrus*.[45]

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[40] *B[elomicrus]* (*Belomicrus*) *sordidus* Arnold, Ann. Transvaal Mus., XII, p. 71, figs. 9, 9a, 9b, (1927); [♀, ♂; South Africa, Cape Province: Aliwal North].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

[41] *B[elomicrus]* (*Nototis*) *bicornutus* Arnold, Ann. Transvaal Mus., XII, p. 64, figs. 3, 3a, 3b, (1927); [♀; South Africa, Cape Province: 38 miles east of Ceres, Little Karroo].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).

[42] *Belomicrus* (*Nototis*) *crassus* Arnold, Occas. Pap. Rhodes. Mus., no. 3, p. 32, figs. 26, 26a, (1936); [♂; South Africa, Cape Province: Matjes Fontein].

[43] *Oxybeloides fasciatus* Radoszkowski [in Fedtschenko], Reise in Turkestan, II, Sphegid., p. 68, pl. VIII, fig. 3, (1877); [♂ (*recte* ♀); Turkestan]. *Oxybelus radoszkowskyi* Dalla Torre, Catal. Hymen., VIII, p. 647, (1897); [new name for *Oxybelus fasciatus* (Radoszkowski, 1877) [D. T'.], *nec* Dahlbom, 1845]. *Belomicrus* (*Oxybeloides*) *fasciatus* Kohl, Konowia, II, p. 182, (1923).

[44] *Belomicrus* (*Oxybeloides*) *borealis* Forsius, Notul. Entom., III, p. 65, figs. 1, 2, (1923); [♀; Finland, Province of Ik: Sakkola parish in Karelia]. —Merisuo, Notul. Entom., XIII, p. 72, figs. 1-5, (1933); [♂; Finland, Province of Ab: Perniö in Varsinais-Suomi].

There remain two Old World species which, due to lack of material and the inadequacy of existing descriptions and figures, I am unable to place with any degree of certitude. One of these is the Abyssinian form *mirificus*,[46] a species which is apparently all that its name implies. Kohl regarded it as somewhat intermediate[47] between *Belomicrus* in the restricted sense and *Oxybelomorpha* and devoted much space to the description and portrayal of the peculiar features of its head and pronotum, but disregarded or passed over lightly the more fundamental characters of the species. Despite the fact that the mandibles lack an excision on the lower margin, Kohl placed *mirificus* in the subgenus *Oxybelomorpha*. Until the unique type may be restudied in the light of the evidence presented in these pages, the phylogenetic position of *mirificus* must remain a mystery.

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[45] Konowia, II, pp. 8, 184, (1923).

[46] *Belomicrus mirificus* Kohl, Zeitschr. f. Hymen. u. Dipt., v, p. 225, (1905); [♀; ABYSSINIA]. *Belomicrus* (*Oxybelomorpha*) *mirificus* Kohl, Konowia, II, p. 194, figs. 15, 22, (1923); [♀].—Arnold, Ann. Transvaal Mus., XII, p. 70, figs. 8a, 8b, (1927); [♀].—Arnold, Check-List Sphegid. Ethiop. Reg., p. 14, (1930).—Scott, Ann. & Mag. Nat. Hist., (10), XI, p. 369, (1933).

[47] "*transiens ad Oxybelomorpha* Br."; Konowia, II, p. 21, (1923).

Lack of any material or very definite information concerning the Piedmont form *italicus*,[48] the genotype of *Belomicrus*, has proven a stumbling block and a weak point in any work on the present genus. Costa's description of the genus and species was rather inadequate, and since originally described, it has apparently never been taken except by Gribodo whose few additional remarks are none too helpful. The little that is known of *italicus* indicates it is very probably a member of the genus *Belomicrus* as here understood, but to what group it belongs, or what its exact characters are, is problematic. From the brief description of Costa and the notes of Gribodo, I infer the postscutellum and squamae are more or less like those of the Forbesii Group. In 1923, Kohl remarked that *italicus* has probably been described since under another name,[49] and I am inclined to agree with him. If this be so, then there is a possibility that *steckii* may eventually prove to be the same as *italicus*, or if not, then a species closely related to the former Piedmont form. This uncertainty as to the exact identity of *italicus* is one of the factors which has led me to refrain from adopting any of the conventional subgenera customarily recognized in *Belomicrus*. Furthermore, it has likewise prevented me from proposing any new entities within it. For if *italicus* upon rediscovery and re-examination proves to have the mandibles excised beneath as in *steckii* and its allies, it may then be necessary to propose a complete realignment of the subgeneric nomenclature of the present genus.

In a report on the Sphecoidea and Vespoidea of Tadjikistan, Gussakovskij in 1935 mentions, but does not describe, a *Belomicrus excisus*,[50] merely giving the locality and stating without reference that the description of this form will appear elsewhere. To date no diagnosis of this species has appeared, so far as I can determine, and consequently *B. excisus* Guss., must be regarded as a nomen nudum.

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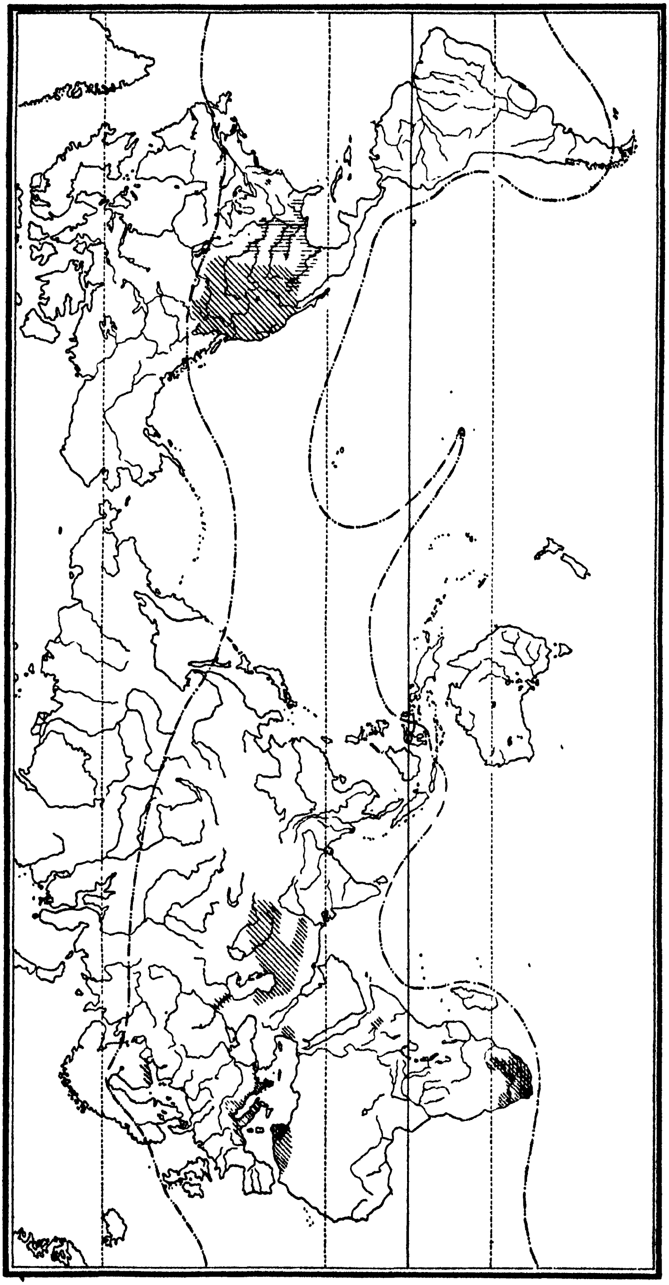
[48] *Belomicrus italicus* A. Costa, Annu. Mus. Zool. R. Univ. Napoli, VI, p. 80, ([1866] 1871); [♂; "Piemonte" (Italy)].—Gribodo, Boll. Soc. Ent. Ital., XVI, p. 80, (1884); [♀].—Kohl, Konowia, II, p. 269, (1923).

[49] Konowia, II, p. 19, (1923).

[50] *Belomicrus excisus* Gussakovskij, Trav. fil. Acad. Sci. URSS, Tadjkistan, no. 5, p. 437, (1935); [♂; TADJIKISTAN: Pass of Zakh-Bursi in mountain range of Peter the Great; 4, VII. 1913; (A. Gol'bek)]. (*Nomen nudum.*)



Text-figure 4. Distribution of the genera of Oxybelini. Horizontal lines show known range of *Belomicroides*; oblique lines, general areas over which *Belomicrus* is locally or more broadly distributed; vertical lines, range of *Enchemicrum*; solid triangles, localities from which *Brimocelus* is known. Dot and dash line indicates approximate known limits of distribution of *Oxybelus*.

Distribution.—The distribution of *Belomicrus* is an excellent example of a discontinuous type, as may be seen by consulting the appended map (Text-fig. 4). Confined in large measure to the warmer xeric areas of the globe, it has thirteen representatives in the Aethiopian region, fifteen in the Palaearctic, and twenty-six in the Nearctic realm. This distributional pattern, while rather unusual in certain respects, is not an uncommon one. Many cases of a similar nature may be cited; the aberrant Fulgorid genus *Orgerius* and its allies,[51] and the composite distribution of the two closely related genera of ants, *Messor* and *Veromessor*, in insects, while in plants, the Zygophyllaceous genus *Fagonia*,[52] are excellent parallel instances. The composite distribution, fossil and recent, of the Hippotragine and Strepsicerine (Tragelaphine) antelopes likewise affords a rather interesting and striking analogy to that of *Belomicrus*.

In the Aethiopian region, *Belomicrus* occurs in greatest abundance in the Cape province and has been reported from as far north as Southern Rhodesia. From this point northward, there are virtually no records until the Abyssinian Highland district is reached and where *mirificus* occurs. Despite this absence of any records at present, the genus may eventually be found rather widespread throughout the xeric areas of the Sudanese and Somali provinces, but it is not likely to be discovered in the humid Congo basin nor the Guinea forest regions. The break in the present distribution is indubitably occasioned by inadequate field work, since there has been little intensive collecting done in, or study of material from, these areas.

The genus ranges widely throughout the Mediterranean and Eremian provinces of the Palaearctic region and invades central Europe to a certain extent; one species (*borealis*) has even penetrated as far north as southern Finland. In Asia, the southeastward limit of its distribution at present is Quetta, Baluchistan. It is surprising that, although without question a xerophile of long standing, *Belomicrus* is apparently not present in the Great Thar of northwestern India nor the Dekkan where ecological conditions would seem extraordinarily favourable to its presence. However, this absence of the genus in India may be only apparent, for the microhymenopterous fauna of that country is still poorly known. Further intensive collecting in the Thar, the Rajput, and Central Provinces may eventually unearth a *Belomicrus* population, but in such case the species in all likelihood will prove to be identical with, or derivatives of, eastern Eremian forms. Northeastward in Asia its range extends only as far as the Golodnaya steppes and the western foothills of the Tian Shan; but when the microfauna of Chinese Turkestan and Mongolia is better known, it will probably be found in those areas. Thus save for certain extensions of its peripheral range, notably in Europe and the Kara Kum and Kyzyl Kum regions of central Asia, the present Old World distribution of *Belomicrus* closely parallels that Bequaert gives for the Myrmicine ant *Messor*,[58] which like *Belomicrus* is markedly xerophilic.

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[51] Melichar, Rev. Russe Entom., XIII, p. 146, (1913); *v. et.*: Melichar, Abh. K. K. Zool.-bot. Ges. Wien, VII, hft. 1, (1912).

[52] Popov, Bull. Univ. Asie Centrale (Tachkent), livr. 15, pp. 248-249, 291-292, (1927).

In North America, with the single exception of *bridwelli* which is known from the piedmont of north-central Virginia, *Belomicrus* is widespread throughout the more arid areas of the Upper and Lower Sonoran Zones of the west, ranging from southern British Columbia, Alberta and Manitoba southward to the Mexican boundary west of the twenty-inch isohyet which coincides approximately with the hundredth meridian. Though there are as yet no records of its presence in Baja California, Sonora or the central plateaux of Mexico, it will probably be found there when those areas are systematically collected.

The genus has never been reported from South or Central America, but there is a remote possibility that it may be discovered some day in such xeric areas as the pampas and the Chaco of the Argentine, the Ceará region of northeastern Brazil, or the Tacna-Arica district of the west coast. However, if, as I believe, the genus was not present in North America until at least the middle or late Tertiary, the unstable character of the isthmian link in Central America throughout this period [54] and even early into the Quarternary would act, particularly in the case of a xerophilous entity like *Belomicrus*, as a very effective deterrent to its penetration into the Neogaeic Realm from the continental land mass of North America. However, in this connection, the various hypotheses of a former land connection linking South America with Africa in tropical or southern latitudes which have been postulated by Scharff, Schuchert, Willis, Metcalf, DuToit, von Ihering and an host of other workers, must not be overlooked, particularly inasmuch as the facies of the present Neogaeic *Oxybelus* fauna suggests that it may have been derived, at least in part, from an early African stock which could have presumably reached South America only by some former land bridge or isthmian link. If this be so, then there is every reason to suppose that a stock of *Belomicrus* might have migrated in like manner over some such route to South America from Africa where the genus was presumably present at a quite early date. The descendants of this strain may have survived to the present day and still remain to be discovered, or like the gravigrades, glyptodonts, the toxodonts and numerous others, have disappeared in the great Pleistocene extinction. All this, of course, is largely conjectural; the solution to this problem must await the discovery, problematic at best, of the presence of *Belomicrus* in continental South America.

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[58] Bull. Amer. Mus. Nat. Hist., XLV, p. 359, (1922). Bequaert has not included in this map the East Chinese form, *M. aciculatus*; *cf.*: Wheeler and Creighton, Proc. Amer. Acad. Arts & Sci., LXIX, pp. 357-358, (1934).

The wide and discontinuous present-day distribution of *Belomicrus* is indubitably the result of a more extensive and a more or less continuous area occupied by the genus in former geological periods. In the absence of any palaeontological evidence to support this view, an explanation of the present case must be based largely upon the analogy furnished by other animals. The distribution of the elephants, the magpies, the ants of the *Messor-Veromessor* stock, and the Masarid wasps, may be cited as more or less pertinent examples in this connection. The preponderance of evidence indicates that they, presumably like *Belomicrus*, had their origin in the Old World and reached North America by way of the Siberian-Alaskan land bridge. In the case of *Belomicrus*, the close morphological relationship exhibited by the Nearctic *forbesii* and its immediate allies to the Eurasian Parvulus subgroup, and additionally the peripheral type of distribution displayed by each, lends considerable support to this hypothesis.[55] The period at which this migration and invasion of North America took place is largely dependent upon three factors, to wit: favourable climatic conditions, the presence of a land bridge or isthmian link between Siberian and Alaska, and the relative velocity of speciation in the genus. In the first instance, the marked thermophilic tendencies displayed by the majority of the species of *Belomicrus* necessitates postulating a very different type of climate formerly in Siberia and Alaska if *Belomicrus* has ever been present in those areas. There is abundant evidence, however, indicative of the fact that, at several periods prior to and even during the Pleistocene, the climate of the northern hemisphere was tropical or sub-tropical in character. On the other hand, from a palaeogeographical standpoint, the Siberian-Alaskan land connection, which existed almost uninterrupted from the Lower Jurassic, was severed in the Lower Miocene. But the connection was re-established later for a time in the Pliocene, and the recent work of Smith [56] on the submarine topography of Bogoslof in the Aleutian Islands region, and the research of Zeuner [57] on the Pleistocene glaciation, climatólgy, and variations in sea level, may be adduced as evidence of at least a presumptive nature that a land bridge may have existed in this region during at least part of the recent glacial period.

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[54] *Cf.* Schuchert, Historical Geology of the Antillean-Caribbean Region, 1935.

The rapidity of the formation of species in *Belomicrus* may be deduced inferentially by a consideration of the foregoing facts. The range of the genus without doubt extended throughout northeastern Asia during one or more of these early warm periods, and, if the ancestral stock of the present Nearctic *Belomicrus* fauna crossed over into Alaska and populated North America prior to the Miocene as in the case of the Pemphilidine genus *Tracheliodes*, or during the Pliocene, probably at the same time and by the same route as the Strepsicerine (Tragelaphine) and Hippotragine antelopes, we may assume that speciation is rather slow in the genus. Conversely, if this invasion of North America did not occur until some time during the Pleistocene,[58] the process of species formation in *Belomicrus* may be interpreted as relatively rapid. There is an element of probability in both these assumptions, for the present facies of the Nearctic *Belomicrus* fauna indicates that North America has been populated to a certain degree by successive waves of emigrants from the Old World. Among the early immigrants may be classed the stock of such forms as *apache*, *vanyume*, and *querecho*, while *forbesii* and its immediate allies, as well as certain elements of the Viereck Series, unquestionably represent the later emigrants from Asia. In any event, the subsequent isolation and restriction in range of the genus to its present limits is indubitably attributable to the great orogenies of late Cenozoic time in Europe, central Asia, and North America, and the ensuing series of Pleistocene glaciations, which, additionally in North America, severed the eastern Virginia piedmont form *bridwelli* from its southwestern relatives.

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[55] The postulated relationship of the Nearctic *Belomicrus querecho* with the Palaearctic forms *B. modcstus* and *B. obscurus* is also pertinent in this connection.

[56] Geograph. Rev., XXVII, pp. 630-638, (1937). *V. et.*: Stetson, Proc. Amer. Philos. Soc., LXXIX, pp. 27-33, (1938); and Shepard, Proc. Nat. Acad. Sci., XXII, pp. 496-502, (1936).

[57] Ann. & Mag. Nat. Hist., (11), I, pp. 389-405, (1938); *v. et.*: Proc. Geol. Assoc., XLVII, pp. 379-395, (1937).

The overwhelming majority of species of *Belomicrus* occur today in, and are largely restricted to, arid or semi-arid areas, or at least to regions characterized by hot and relatively dry summers. They usually avoid those regions with a heavy or evenly distributed rainfall, whether in tropical or temperate parts of the world. That this xerophilous habit is evidently one of long standing may be adduced from the development of a psammophore in the females. This feature is analogous to that displayed by such deserticolous genera of ants as *Messor*, *Veromessor*, and *Pogonomyrmex* whose distribution often closely parallels that of the present genus.

Our knowledge of the distribution of the various Nearctic species of *Belomicrus* is still largely in its inchoate stage. A study of the accompanying maps (Text-figs. 1, 2, 4) shows all too clearly the many hiatus and lacunae that still exist, particularly in the Great Basin area, and the necessity of further field work in that region. Only in southern California is the record anywhere near tolerably complete, and this is due largely to the efforts of Dr. P. H. Timberlake of Riverside, California.

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[58] The glacial interstadia Wurm 1/2 [Post-Iowan?], Mindel 1/2 [early Kansan?], Mindel/Riss [Yarmouth], or perhaps sometime during the Riss [Illinoian] period, are likely times when these invasions may have taken place.

Ethology.—There is a wealth of information relative to the biology of *Oxybelus,* some of it dating as far back as 1746;[59] but, save for a few scattered flower records, nothing has been known of the habits of *Belomicrus* until quite recently. The sole authoritative data on the biology of the present genus is embodied in a short but excellent paper published in 1936 by Dr. Francis X. Williams on the habits of *Belomicrus franciscus.*[60]

Dr. Williams states that *Belomicrus franciscus* was not infrequently seen in late April and May of 1930, sunning itself on a tiny path, patronizing the flowers of the little sand-mat (*Pentacaena ramosissima*) or engaged in nesting activities on the southern and southeastern slopes of Lone Mountain, a sand covered hillock about 468 feet above sea level, now within or near the confines of the city of San Francisco. The females dig their burrows in the sand; sometimes two or more burrows may exist rather close together and thus form a tiny colony of *Belomicrus.*[61] Unlike its larger relative *Oxybelus,* this wasp does not use her legs terrier-fashion to throw the sand behind and out of her burrow, although at the beginning of operations she may employ the fore legs a bit to help clear the nesting site. The female *Belomicrus* first detaches the sand with her jaws and then, probably using the pecten of her fore tarsi, sweeps a load of sand into her psammophore and rises obliquely backward in the air with her load which she releases at the moment of swinging obliquely downward to her burrow. These flights, each of several inches, are successively repeated, and the wasp soon plunges out of sight in the deepening tunnel. It is interesting to note that in excavating, the wasp always backs out of her burrow and maintains this backwards position, flying tail first obliquely upwards and returning head first obliquely downwards. Thus the sand is not heaped up at the mouth of the tunnel, but is scattered or dropped from the air, much after the fashion of a steam-shovel. The momentum of flight and its sudden termination are sufficient to transfer the sand in a parabolic curve to some distance from the entrance of the nest. It sometimes requires the better part of two days for the female *Belomicrus* to dig her nest, particularly if the weather is dull or cloudy. Williams was unable to trace the burrows through the sand, but he believes they cannot be deep, and probably have several cells each. When the wasp has finished excavating at least for the time being, she issues head first from the nest, as do other wasps under similiar circumstances. Contrary to the usual practice of *Oxybelus* and many other fossorial wasps, the entrance to the burrow of *franciscus* is left open and not stoppered with sand when the female departs on a provisioning expedition.

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[59] Linnaeus, in the first edition of his *Fauna Suecica* (1746), remarks under *Apis nigra* [=*Oxybelus uniglume* (L.), (p. 303, no. 1011)]: ". . . habitat passim in hortis. Licet minima sit, saepe tamen Muscam domesticam [*i. e. Calliphora* sp.], se triplo vel quadruplo majorem, occisam secum trahit . . ." In 1769, Wallis gives essentially the same observations in his "Natural History and Antiquities of Northumberland" (vol. I, p. 350). These are the earliest known references to the biology of any member of the Oxybelines.

[60] Pan-Pacific Ent., XII, pp. 3-6, (1936).

[61] This gregarious habit is likewise characteristic of many species of *Oxybelus,* e.g. *O. 4-notatum, O. subulatum,* etc.

Barth [62] has reported *Anacrabro ocellatus* excavating its nest in a manner similar to that of *Belomicrus franciscus*. In the pine barrens of New Jersey near Medford, I have frequently noticed the females of *Oxybelus subulatum* digging their burrows in a similar fashion; the latter, however, lack the psammophore so characteristic of the female *Anacrabro* and *Belomicrus*. In the case of both *Anacrabro* and *O. subulatum*,[63] the entrance of the nest is left open, as in *Belomicrus franciscus*, when the wasp absents herself, either during the excavation period or on her hunting expeditions.

Whereas *Oxybelus* invariably preys upon flies, especially Cyclorrhapha, *Belomicrus franciscus* provisions her nest with *Trichôchrous antennatus* Mots., a small Melyrid beetle which is abundant on the flowers of poppies (*Eschscholtzia*) and certain composities. Williams found that several prey-laden females halted for a rest some distance from the nest, and the immobile beetle was observed clasped tightly beneath their bodies. After a slight pause, the wasps flew directly to their open tunnels which they entered without hesitation. Inasmuch as *franciscus* is considerably larger than her prey, it is quite probable that each cell is provisioned with a number of beetles for the wasp grub.

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[62] Bull. Wisconsin Nat. Hist. Soc., VI, p. 147 *et seq.*, (1908).

[63] Since *O. subulatum* is a relatively generalized form, may this represent an atavistic tendency on its part?

A peculiar and characteristic feature of many genera and species of Aculeates inhabiting arid or semiarid regions is the presence of a psammophore or "sand basket" in the capitothoracic region. This is composed of series of unusually long curved hairs or macrochaetae arranged in definite rows around the oral region and the ventral surface of the head, and on the fore legs. The arrangement of the macrochaetae is various, depending on the genus or species involved, but is usually constant for any particular form studied. Although these hairs had long been known to systematists, no connection between their presence and a pronounced xerophily was adduced until 1907 when Wheeler published a paper discussing this subject in ants.[64] This author's interesting exposition on the arrangement of these macrochaetae was unfortunately vitiated by his rather far-fetched though ingenious theories as to their probable function. Two years later, however, Santschi showed conclusively that this gular crate of hairs, which he termed a psammophore, is used as a basket to carry the sand and dust to the surface while the ants are excavating their burrows.[65] Without some such equipment, the species nesting in dry earth or sand would probably find excavation a laborious and time consuming process, since the mandibles are obviously not suited to the transportation of very finely divided or powdery substances. While most authors are now familiar with the psammophore and its function in ants, few, if any, have realized the widespread occurrence of this feature throughout the various groups of aculeate Hymenoptera. Only a few instances of this may be given here. The elongate, flattened, and heavily ciliated labial palpi of the females of the Diplopterous genus *Pterocheilus* are doubtless used as a psammophore.[66] The Aethiopian Psammocharid genera *Spuridiophorus*, *Rhynchopompilus* and *Aethiopompilus* exhibit a remarkable development of ammochaetae in the oral region and, as Arnold has noted,[67] serve the same function in these wasps as in the psammophilous ants of the genera *Pogonomyrmex*, *Ocymyrmex* and *Veromessor*.[68] Many Sphecoids, of which *Anacrabro ocellatus*, *Sphex wrightii* and *S. ferruginosus* may be cited as pertinent examples, exhibit a well developed psammophore which, as I can testify from personal observation, is used for the same purpose as that of the foregoing genera.

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[64] Wheeler, W. M. On certain modified hairs peculiar to the ants of arid regions. *Biol. Bull.*, XIII, pp. 185-202, illus., (1907).

[65] Santschi. F. Sur la Signification de la Barbe des Fourmis Arénicoles. *Rev. Suisse Zool.*, XVII, pp. 449-458, illus., (1909).

In *Belomicrus*, the psammophore consists of at least five series [69] of ammochaetae: [70] first, a transverse row on the clypeus, the clypeal ammochaetae, which are usually absent; second, a long series on the lower margin of the mandibles, the mandibular ammochaetae; third, a strong set arranged vertically along the line separating the temples from the gular region, the temporal ammochaetae; fourth, a tuft on the lower outer angle of the proepisternum, the humeral ammochaetae; and finally, a series disposed along the lower hind margins of the fore trochanters, femora and tibiae, the trochanteral, femoral and tibial ammochaetae respectively. All of these series are not present in every species; the clypeal ones are seldom apparent, and the humeral, trochanteral and tibial ones are often absent. Moreover, old or worn specimens have frequently lost all or practically all the ammochaetae through constant use. In Arnold's figure of *Belomicrus* (*Nototis*) *bicornutus*,[71] the lateral angles of the pronotum are shown with a series of long hairs; these, I presume, are a series of ammochaetae peculiar to the Nototis or Bicornutus

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[66] As this goes to press, a copy of R. M. Bohart's revision of the Nearctic species of *Pterocheilus* (1940, Ann. Ent. Soc. Amer., XXXIII, pp. 162-208) has come to hand. Therein the author states (p. 164, *teste* G. E. Bohart): ". . . the pendulous labial palpi of the female are used in carrying earth from the nest during its construction."

[67] Occas. Pap. Rhodesian Mus., no. 3, p. 1, (1934).

[68] *Cf.*: Wheeler, 1930, Demons of the Dust, pp. 65, 67.

[69] Occasionally there is discernible a sixth set along the distal margin of the labrum when this is visible.

[70] Literally "sand hairs" ἄμμος + χαίτη, a term applied to them by Santschi [*cf.*: Rev. Suisse Zool., XVII, pp. 449-458. (1909)].

[71] Ann. Transvaal Mus., XII, p. 64, fig. 3, (1927).

Group of species. They are not present in any of the North American or Old World species that I have studied.

Although the psammophore, like the pecten on the fore tarsi, is characteristically a feature of the female sex, the males of some species, particularly in the genus *Belomicroides*, display a few rudimentary ammochaetae. This, however, is by no means as common an occurrence in the males of *Belomicrus* as the presence of a vestigial pecten on the fore tarsi. The presence of this latter feature in the Forbesii Group and of the former in the African species *Belomicroides pictus* and *B. maurusius* occasioned me in a paper published some years ago on certain Algerian Oxybelines[72] to tentatively postulate the theory that the males of such forms might dig a burrow,—either to assist the female, or to provide a retreat for themselves from the excessive heat of the desert. Shortly thereafter, Dr. F. X. Williams wrote me: ". . . regarding the male of the Algerian *Belomicroides* that has a rudimentary psammophore and the possibility that it assists the female in excavating the burrow, I should not think that this would be the case. The males of many species of wasps—I have noticed particularly the Larridae—dig in the soil, particularly sand, for the night or dull weather perhaps, and it is reasonable to suppose that they too have a vestige of digging bristles—which as I remember is the case. It seems that their interests are wholly selfish in this matter . . ." Investigation of this point has demonstrated conclusively that Dr. Williams' contention is indubitably correct.

The adults of *Belomicrus* frequent flowers, particularly buckwheats such as *Eriogonum fasciculatum* and various other species of that genus, or composites like *Lepidospartum squamatum*, *Gutierrezia lucida*, and *Baeria chrysostoma* var. *gracilis*. On the whole, the species of *Belomicrus* are polytropic, for they have been taken at a great variety of flowers, *e.g.* the desert willow (*Chilopsis linearis*), nievitas or white forgetmenots (*Cryptantha intermedia*), mustards (*Oxypolis occidentalis*) tamarisks (*Tamarix* spp.), mallows and hollyhocks (*Malva pusilla* and *Sphaeralcea ambigua*), spurges like the rattlesnake weed (*Euphorbia albomarginata*), buckthorns such as the coffeeberry (*Rhamnus californica*), mesquite (*Prosopis chilensis*), five fingers (*Potentilla*

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[72] Bull. Soc. Hist. Nat. Afrique du Nord, XXII, p. 112, (1931).

glandulosa), stone-crops (*Sedum* spp.), the Mohave stinkweed (*Cleomella obtusifolia*), poppies (*Eschscholtzia* spp.), the little sand mat (*Pentacaenia ramosissima*), sand verbenas (*Abronia villosa*), amaranths (*Cladothrix cryptantha*), and even the ubiquitous Bermuda grass (*Cynodon Dactylon*). They visit these flowers not only to obtain the nectar but also in all probability utilize them as hunting grounds for the beetles with which they provision their nests.

ENCHEMICRUM Pate

Enchemicrum Pate, Ent. News, XL, p. 219, (1929).—Pate, Mem. Amer. Ent. Soc., no. 9, p. 25, (1937). — Pate, Philippine Journ. Sci., LXIV, pp. 376, 386, (1937 [1938]).

GENOTYPE: *Enchemicrum australe* Pate, 1929. (By original designation.)

The general habitus of *Enchemicrum* is very similar to that of the Oriental *Anoxybelus* section of *Oxybelus* to which the present genus is most closely related. The distinctly appendiculate marginal cell of the fore wing, the swollen last tarsal segment, the convex abdominal venter, the absence of a psammophore in the female sex, and the superficial facies of the head and thorax attest the close affinity of *Enchemicrum* to *Oxybelus*. But the ecarinate scutellum and postscutellum, the absence of a vertical carina on the mesepisternum before the middle coxae, and the emarginate character of the mandibles immediately stamp *Enchemicrum* as a distinct phyletic unit discrete from the ubiquitous multispecific *Oxybelus*. The present genus is evidently a relict group, derived from a Brimoceloid stock, and in all probability is a representative of the ancestral stirps from which *Oxybelus* has arisen.

Generic Characters.—Small forms. Head subquadrate to suborbicular in anterior aspect, transversely oval in dorsal aspect; eyes elongate oval, more coarsely facetted anteriorly than posteriorly, reaching to the bases of the mandibles, inner orbits gently arcuate, slightly divergent above and below. Vertex rather flat, not produced appreciably above the dorsal margins of the compound eyes; ocelli normal, arranged in a curved line, the postocellar distance distinctly longer than the ocellocular line, a weakly impressed furrow running obliquely forward from the hind ocelli to the dorsal margins of the inner orbits. Temples moderately wide above, tapering ventrad. Malar space obsolete. Antennae short, simple, thirteen-segmented in males, twelve-segmented in females, situated low on face on dorsal margin of clypeus. Clypeus narrow, transverse. Labrum narrow, transverse, with apical margin entire, rounded; usually reflexed beneath clypeus. Maxillary palpi six-, labial palpi four-segmented. Mandibles falcate, apex simple, acuminate; inner margins with a blunt dentiform angle on basal third; lower margins provided with a row of long ammochaetae, and subemarginate in females, and distinctly excised in males. Females without a psammophore.

Thorax relatively stout. Pronotum narrow, linear, transverse, situated about on a level with the mesonotum, the tubercles not attaining the tegulae. Mesonotum relatively flat to tumid; suture between mesonotum and scutellum impressed and more or less foveolate and somewhat widened laterally; scutellum subsemicircular, distinctly margined laterally, not carinate medially; postscutellum flatly subtrigonal, not carinate medially, lateral margins furnished with distinct alate expansions, the squamae, Mesopleura with an epicnemium anteriorly, episternal suture passing vertically from below the tegulae, hyposternauli[73] distinct, discoposteriorly with episternal pit strong and well impressed, no vertical precoxal carina before nor supracoxal tooth above the middle coxae. Propodeum with a median dorsal, backward projecting process, the mucro; with well developed lateral carinae, and posterior face with a well demarcated discal areole.

Fore and hind wings in general as described under tribal diagnosis.[74] Fore wings with marginal cell truncate at apex and furnished with a distinct appendiculate cell; transverse cubital vein somewhat oblique, the serial first recurrent—cubital vein scarcely angulate but practically straight. Hind wings with the anal lobe almost as long as the submedian cell.

Legs rather short and stout, with the fore and middle femora sublunate, the hind femora subfusiform, straight, not bowed, with the genicular area simple. Tibiae obterete, the middle and hind pair moderately spinose on outer or extensor surface; middle tibiae with one apical calcar, but without a calcaral furrow; hind tibiae with two apical calcaria. Tarsi simple, the last article inflated or swollen, particularly in the females which have a small but distinct pecten on the fore tarsi; the males with rudiments of a pecten sometimes apparent; claws simple, edentate; pulvilli moderate. Females without distinct ammochaetae on fore legs. Males with fore coxae simple, not sulcate.

Abdomen sessile, oval; tergites not abruptly flexed under at the sides (as in *Belomicrus*) but folded under roundly to the venter and imbricate with the convex sternites; ultimate tergite with a distinct pygidial area which is trigonal in females and subrectangular in males; hypopygium of both sexes simple.

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[73] A horizontal furrow or suturoid impression running caudad from the lower end of the episternal suture to the meso-metapleural suture just above the articulation of the middle coxae.

[74] *Cf.*: Trans. Amer. Ent. Soc., LXVI, p. 4, (1940).

Remarks.—The present autochthonous Sonoran genus is evidently a type of considerable antiquity. Like *Brimocelus* in South Africa and the *Anoxybelus* complex hung on the fringes of the Oriental region, *Enchemicrum* is probably one of those relict entities localized here and there throughout the world, generally in peripheral areas, which have been able to survive with a minimum of modification for a relatively long period of time. Whether *Enchemicrum* had a common ancestor with the Old World *Anoxybelus* group,[75] as I am inclined to believe may be the case, is still problematic, and equally so whether the northern Pacific Siberian-Alaskan land bridge figured in the movements of its ancestors. Should the latter assumption prove true, the ancestral stock of *Enchemicrum* certainly arrived on the North American continent rather early in the Cenozoic period, and later, retreating southward before the successive waves of Pleistocene glaciation, eventually became localized in the Llanorian region, whence in recent times it has been pushing out and repopulating the Gulf Coastal strip and adjacent Sonoran areas of the southern and central United States.

Distribution.—The genus *Enchemicrum* is restricted entirely to the North American continent, ranging throughout the Lower Austral and adjacent life zones of the Sonoran Region. The distribution coincides with that of the genotypic and sole included species, *E. australe*.

Enchemicrum australe Pate (Text-fig. 5.)

Enchemicrum australe Pate, Ent. News, XL, p. 220, (1929); [♂, ♀. Burkville; Alabama. Darrow; Logansport; Louisiana. Tulsa; Oklahoma. Fedor; Richmond; Galveston; Texas. San Suor (sic!), Arizona].

Inasmuch as *Enchemicrum* is monotypic, the distinguishing features given for the genus will likewise serve to differentiate the sole included species from the other Oxybeline wasps.

Type.—♂; Tulsa, Tulsa County, Oklahoma. July 18, 1914. (J. C. Bradley.) [Cornell University, Type no. 944.]

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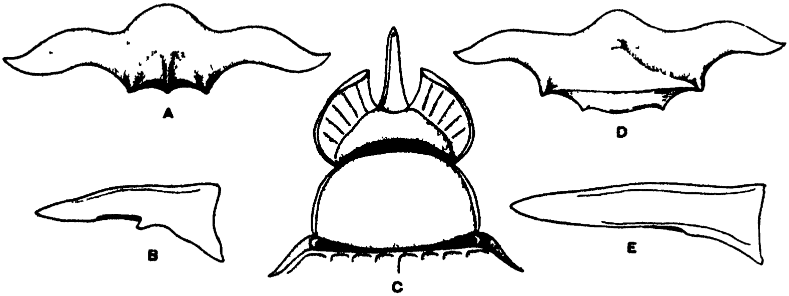
[75] This conclusion is based upon evidence adduced from a study of Formosan material of *Anoxybelus*. The unsettled conditions now current in the western part of the Palaearctic region have prevented publication of this data.

Male. 4.5 mm. long. Black; the following deep stramineous: mandibles save for the rufous apices and inner marginal tooth, flagellum except for an elongate fuscous spot posteriorly, pronotum to and including the tubercles, axillary sclerites, postscutellum, fore and middle femora apically and beneath, hind femora narrowly annulate at apex, all tibiae on outer extensor surface, basal segments of tarsi (which become fulvescent distad), first abdominal tergite laterally on each side with a broad ovate subapical spot, and second abdominal tergite with similar but smaller ones. Pedicel and base of flagellum brunneous, the latter fulvescent on distal half. Fore tibiae flavoferruginous beneath. Last two abdominal segments ferruginous. Tegulae fulvous hyaline. Squamae and mucro pellucid-hyaline. Wings clear hyaline; stigma and veins deep fulvous.

Head subquadrate, broader than long in anterior aspect; front and clypeus rather heavily clothed with dense appressed silvery pile; vertex with sparse, suberect, puberulent pubescence; temples with fine, appressed silvery pubescence. Front subfulgid, with moderately fine and close punctures; flat except above just below anterior ocellus where there is an inconspicuous median longitudinal keel on each side of which the surface is shallowly concave to the inner orbits; width of front at distal end of scapes four-sevenths (.57) the vertical length of eye. Vertex fulgid, with finer puncturation than front: postocular region simple, not tuberculate; ocelli rather large, situated in a curved line, the postocellar line three times the length of the ocellocular distance, and with a shallow, nitidous, arcuate impression running obliquely forward from the hind margins of posterior ocelli to the upper inner orbits. Temples finely striatopunctate; temporal carinae wanting; post-temporal region fulgid and with fine scattered punctures. Antennae reaching about to occiput, situated low on face on dorsal margin of clypeus about as far from each other as from nearest eye margin; scape straight, obterete, four-tenths the length of eye; pedicel obterete, subequal in length to first flagellar article; flagellum finely puberulent, first and second segments longer than broad and subequal in length, remainder except last subquadrate, all simple, none rounded out beneath, last segment simple, terete, subequal in length to preceding two articles combined. Clypeus narrow, transverse, finely punctate, flat and shallowly concave laterally to strongly tumid discally, median length three-tenths the vertical length of eye, produced medio-apically into a short broad tridentate lobe, the apical width of which is subequal to the median length of clypeus. Mandibles falcate, apices acuminate and simple; inner margins with a low, blunt, obtuse dentiform angle medially; lower margins distinctly excised medially and provided with a row of short ammochaetae.

Thorax fulgid; dorsal surface with short suberect light pubescence; mesopleura with appressed silvery pubescence. Pronotum narrow, transverse, linear, the anterior dorsal margin distinctly notched medially and provided with a high, sharp, lamelloid carina continuous to the tubercles; anterior surface very finely punctate and laterally perfulgid and with fine horizontal rugulae. Mesonotum with moderately fine non-contiguous punctures, the disc shallowly concave longitudinally, anterior eighth with a very inconspicuous fine double longitudinal line medially, posterior margin foveolate and medially with a short carinule running forward for a short distance; suture between mesonotum and scutellum strongly impressed and somewhat widened laterad; scutellum subsemicircular, punctured like mesonotum, gently tumid discally, ecarinate medially, laterally with narrow laminate margins; postscutellum transversolunately subtrigonal, very finely punctured, tumid discally, ecarinate medially, one-half the length of scutellum. Squamae subrectangular, flat to flaring upward, transversed by fine subparallel carinulae, situated obliquely along posterior margin of postscutellum and contiguous medially behind, the apices acute, posterior emargination broadly U-shaped. Mucro three-fourths the length of scutellum, slender, straight, acuminate, canaliculate above, apex entire and acute.



Text-figure 5. *Enchemicrum australe* Pate. Male (*type;* Tulsa, Oklahoma): A, clypeus; B, ventral aspect of mandible; C, scutellum, postscutellum, squamae, and mucro. Female (*allotype;* Tulsa, Oklahoma): D, clypeus; E, ventral aspect of mandible. (Greatly enlarged; all figures drawn to same scale.)

Mesopleura with fine close punctures obscured by the heavy pile; anteriorly with a sharp epicnemium which is continuous onto mesosternum; episternal suture and hypersternauli very strongly impressed and somewhat foveolate, episternal pit strongly impressed; epipleura simple. Metapleura perfulgid, glabrous, with coarse horizontal striae. Propodeum fulgid, microscopically punctate and with a very fine, suberect, inconspicuous, argentoaeneous puberulent pile throughout; dorsal face with lateral areas bisected by an oblique carina (an emanation from the dorsolateral angles of discal areole) and traversed by a few subparallel oblique carinae; dorsal and posterior faces separated by an oblique subhorizontal carina; posterior face discally with a sharply demarcated cuneate areole which is glabrous and nitidous within, the lateral areas with a few inconspicuous horizontal striae or carinulae; lateral carinae well developed, sublaminate, particularly above, and distinctly bifid ventrally below in valvular region; lateral faces simply microscopically punctate.

Fore coxae simple, not sulcate; fore tarsi with rudiments of a pecten. Hind femora straight, apex simple with no trace of fornication.

Abdomen fulgid; clothed with short appressed silvery pubescence. Tergites with fine separated punctures; sternites with puncturation somewhat coarser, the second to sixth with a transverse, glabrous, nitidous, subapical welt. Pygidium well defined, elongate subrectangular, lateral margins converging slightly distad, the disc with fine contiguous punctures; hypopygium simple, with apex entire.

Allotype.—♀; Topotypical. Same data as type. [Cornell University.]

Female. 5.4 mm. long. The following features are solely those noteworthy of difference from the ones given in the foregoing description of the male (type).

Livery in general the same as male but scape of antenna stramineous apically only. Abdomen with maculations smaller, and only last segment bright ferruginous.

Clypeus flat and finely punctate laterally to trigonally tuberculate discally; distad of tubercle surface is glabrous, nitidous, and gently declivent to apical margin, giving the appearance of a low trigonal, deflexed bevel; apical width of median lobe twice that of the median clypeal length, apical margin of lobe quadridentate, with a gently sinuous median portion and a distinct emargination between each two lateral teeth. Mandibles with tooth on inner margin acute and more prominent; lower margin subemarginate medially.

Propodeum with lateral areas of dorsal face without oblique bisecting carinule; lateral faces with a few marginal rugulae.

Fore tarsi with a distinct, though small, pecten.

Abdomen with transverse, subapical welts on second sternite only. Pygidium trigonal, the disc with fine contiguous punctures; hypopygium simple.

Variation.—Aside from minor variations in the livery and in the sculpture of the propodeum, the material of *australe* examined shows little deviation from the typical pair. The abdominal maculations may be more or less extensive; the third and fourth tergites may have small spots laterally, or the abdomen may be unmarked except for the first tergite. Moreover, the abdomen may be entirely devoid of rufous caudally, or, rarely, this may extend to include several of the posterior segments. The antennal scape, and even the flagellum, may be wholly black. The propodeum may have but a few transverse carinulae on the lateral areas of the posterior and dorsal faces, or may have more than displayed in the typical pair, while frequently the lateral faces possess a few irregular rugulae. All these deviations from the norm, however, may be regarded as merely individual variations; none appear to be of specific or racial significance.

Specimens examined: 60; 48 males, 12 females, as follows:

GEORGIA: Bainbridge, Decatur County; July 15-27, 1909: (J. C. Bradley); 6 ♂; [Cornell].

ALABAMA: Burkville, Lowndes County; June 10, 1917; (J. C. Bradley); 6 ♂; [*paratypes*, Cornell]

LOUISIANA: Darrow, Ascension Parish; June 19, 1917; (J. Bequaert); 1 ♀; [*paratype*, Cornell]. Opelousas, St. Landry Parish; (G. R. Pilate); 1 ♀; [U. S. N. M.]. Logansport, De Soto Parish, June 1, 1918; (J. C. Bradley); 2 ♂; [*paratypes*, Cornell].

TEXAS: Brownsville, Cameron County; 1921; (J. C. Bridwell); 1 ♀; [U. S. N. M.]. Galveston, Galveston County; May 30, 1918; (J. C. Bradley); 1 ♂; [*paratype*, Cornell]: May; (F. H. Snow); 1 ♀; [Univ. Kansas]. Richmond on Brazos River, Fort Bend County; June 22, 1917; (J. C. Bradley); 2 ♂; [*paratypes*, Cornell]. Fedor; July 7; (G. Birkmann); 1 ♀ [*paratype*, A. N. S. P.]: September; (Birkmann); 1 ♀; [M. C. Z.]. Lee County; May, 1908; (Birkmann); 1 ♂; [M.C.Z.].

ARKANSAS: Lewisville, Lafayette County; June 2, 1918; (J. C. Bradley); 4 ♂, 1 ♀; [Cornell]. White River near mouth, Arkansas County; August 9, 1930; (J. C. Bradley); 15 ♂; [Cornell].

OKLAHOMA: Broken Bow, McCurtain County; June 29, 1937; (Standish & Kaiser); 1 ♀; [Okla. Agr. Coll.]. Durant, Bryan County; June 2, 1905; (C. R. Jones); 1 ♂; [U. S. N. M.]. Waurika, Jefferson County; July 4, 1937; (Standish & Kaiser); 1 ♂; [Okla. Agr. Coll.]. Noble, Cleveland County; August 4, 1932; (Edw. Ivy); 1 ♂; [Okla. Agr. Coll.]. Gore, Sequoyah County; July 20, 1937; (Standish & Kaiser); 1 ♂; [Okla. Agr. Coll.]. Tulsa, Tulsa County; July 18, 1914; (J. C. Bradley); 3 ♂, 1 ♀; [*type, allotype* and *paratypes*, Cornell].

KANSAS: Hays, Ellis County, 2 ♀, 1 ♂. Smith County; elevation, 1800 feet; September 4, 1912; (F. X. Williams); 1 ♂. Phillips County; elevation, 1940 feet; August 30, 1912; (F. X. Williams); 1 ♀. [All Univ. Kansas].

ILLINOIS: Quincy, Adams County; July 4, 1889; (Chas. A. Hart; on sand bars and shores); 1 ♂; [Ill. Nat. Hist. Surv.].

ARIZONA: San Simon,[76] Cochise County; elevation, 3601 feet; July 14, 1917; (J. C. Bradley); 1 ♂; [*paratype*, Cornell]

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[76] Due to an imperfect label, this specimen was originally recorded [1929, Ent. News, XL, p. 221] with some question as "San Suor (sic)." Neither then, nor since have I been able to find any such locality as "San Suor", but Dr. Bradley's journal of the Cornell University Biological Expedition of 1917, (reprinted in part in *The Scientific Monthly*, VIII, pp. 383-437, [1919]), indicates that on July 14, 1917, he collected at San Simon, Arizona, and I have assumed that this is the locality where the specimen was taken.

Distribution.—The present species is primarily an inhabitant of the Austroriparian Zone of the southern and central United States, ranging throughout the Sabalian Zone and the lower coastal plain of the Gulf Coastal strip from Brownsville, Texas, to southwestern Georgia (Bainbridge); thence it has worked its way up along the water-courses of the Mississippi drainage as far north as Quincy, Illinois, and Hays and Ellis Counties in north-central Kansas. An interesting and noteworthy feature of the distribution of *Enchemicrum australe* is that practically every specimen of it I have examined has been taken at localities situated on streams whose drainage is to the south into the Gulf of Mexico. This would tend to substantiate the hypothesis advanced on a foregoing page that *Enchemicrum,* driven southward into the ancient land mass Llanoria and the Mexican Highlands region by Pleistocene glaciation, is now in process of repopulating at least some part of its former territory.

In many respects, the distribution of *E. australe* resembles that of the Gorytine *Ammatomus* (*Tanyoprymnus*) *moneduloides,* whose biogeographical history probably parallels that of the present species. If, however, the range of *A. moneduloides* be taken as a criterion of the probable distribution of *E. australe,* then the latter form may be expected to occur in northern and possibly central but not necessarily southern Florida, and also in the coastal plain of the Atlantic seaboard as far north as central North Carolina. But it is not likely that the range of *australe* extends across the Arizona Highlands, the Colorado and Mohave Deserts into south-central California as does that of *A. moneduloides.* Yet the anomalous and, I am inclined to believe, somewhat suspicious record of the occurrence of *E. australe* in the San Simon Valley of southeastern Arizona may be an indication that this happens, at least in certain measure.

Though there are as yet no records of its occurrence in Mexico, I feel reasonably confident that *E. australe* will eventually be taken in the northern and eastern states of that country, particularly in Tamaulipas, Nuevo Leon, Coahuila and Vera Cruz.

NOTES ON ORIENTAL POLISTES WASPS

(HYMENOPTERA: VESPIDAE)

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(Text-figures)

A revision of Oriental Polistinae has been in progress for some years. The following notes are now published in order to validate names distributed to various collections.

Polistes tenebricosus Lepeletier

The characters and variation of this species were discussed in a recent paper,[1] where I accepted five color forms. I have since recognized two other forms in collections received from the Philippines. The seven forms may be separated as follows.

1. Abdomen brownish-black to ferruginous, or predominantly black and only very narrowly russet at the apices of some of the tergites 2
   One or more tergites of the abdomen either extensively orange-yellow or with distinct orange-yellow apical bands 4
2. Head, thorax and abdomen velvety-black; some of the tergites very narrowly ferruginous at apex. Wings orange-yellow. (Philippines). var. *nigrosericans*
   Thorax and abdomen more or less blotched with mahogany-brown or ferruginous. Wings brownish-russet 3
3. Thorax entirely or mostly mahogany-brown or ferruginous; mesonotum and pleura sometimes black. (Sunda Islands; Formosa). typical *tenebricosus*
   Thorax black, except for the ferruginous pronotum and sometimes ferruginous spots on scutellum. (Southern China, northern India). var. *sulcatus*
4. Only the second abdominal tergite mostly or entirely orange-yellow. (India, Sumatra, Java) ....var. *hoplites*
   Orange-yellow color present on two or more abdominal tergites 5

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[1] Bull. Mus. R. Hist. Nat. Belgique, x, No. 28, pp. 5-11, 1934.

5. First three or four abdominal tergites extensively orange-yellow (the second mostly so). Head and thorax black. (Philippines). var. *leopoldi*

   First three of four abdominal tergites with moderately wide orange-yellow apical bands (the second not mostly of that color) 6

6. Head and thorax black. Abdomen black with orange-yellow apical bands. Wings yellowish. (Philippines) ....var. *sibuyanensis*

   Head and thorax black and ferruginous. Abdomen dark ferruginous, blotched with black and with the apices of first and second tergites dull orange-yellow. (Northern India) ....var. *rugifrons*

Polistes tenebricosus var. (or subsp.) **sibuyanensis** new

Female and Worker. Black, with the under side of the flagellum apically, the mandibles rather extensively, and blotches on the oculomalar spaces ferruginous. First three abdominal tergites with broad orange-yellow apical bands; that of the second the widest, but not covering more than one-fifth of the tergite; fourth tergite with a narrow apical fascia medially. Wings stained with orange-yellow, the veins of the same color. Short pubescence black over the black areas, golden-yellow over the orange bands.

Holotype and *paratypes*.—Females; Sibuyan Island, Philippine Islands; (R. C. McGregor).

Holotype at Museum of Comparative Zoölogy, Cambridge, Mass. Paratypes at the Philippine Bureau of Science, Manila; and at the U. S. National Museum.

Polistes tenebricosus var. (or subsp.) **nigrosericans** new

A striking form owing to the contrast between the velvety-black body and the yellowish wings. It is homeochromic with *Vespa tropica* var. *deusta* Lepeletier.

Female and Worker. Velvety-black, with the under side of the flagellum russet and very narrow ferruginous apices to the first two or three abdominal tergites (usually scarcely visible); teeth of mandibles dull ferruginous. Wings stained with orange-yellow, the veins of the same color. Short pubescence dull velvety-black.

Male. Similar to the female, but blotches on mandibles, clypeus and face, under side of scape and flagellum, blotches on coxae, and under side of femora, tibiae and tarsi, dirty yellow or russet-yellow.

Holotype and *paratypes*.—Females; Los Baños, Luzon, Philippine Islands; (F. X. Williams).

Allotype.—Male; Laguna, Luzon.

Paratypes.—Females; Atimonan, Luzon, (F. del Rosario). Females; Mt. Banahao, Laguna, Luzon. Males and females; Nueva Caceres, Ambas Camarines, Luzon, (H. M. Curran). Female; Lamao, Balaan, Luzon, (A. Celestino).

Holotype, allotype and paratypes at Museum of Comparative Zoölogy, Cambridge, Mass. Paratypes also at the Philippine Bureau of Science, Manila; the College of Agriculture, Laguna; the Academy of Natural Sciences, Philadelphia; and the U. S. National Museum.

Polistes sagittarius H. de Saussure

Although often confused with *P. tenebricosus,* this species shows many structural differences. In both sexes the mesepisternum is not divided by an oblique suture, but forms one single plate; the pronotum is coarsely sculptured, irregularly rugoso-striate on the lateral sloping parts, more reticulo-striate on the dorsal horizontal areas, but not with strong cross-ribs; the propodeum is coarsely ribbed transversely; the claws of the hind legs are symmetrical; the lower fourth of the outer orbits is not bordered by a raised ridge (as the upper portions), but evenly rounded off into the gula. In the male the face is normal, the clypeus slightly convex and broadly contiguous to the eyes, and the antennae are long, with all segments of the flagellum much longer than wide.

The several color forms of *P. sagittarius* closely parallel those of *P. tenebricosus.*

The typical form of the species, described by de Saussure,[2] is black, with russet blotches on head, pronotum and scutellum, the first two abdominal segments mostly bright or dull yellow or orange-yellow, often blotched with ferruginous, the wings strongly fuscous or blackish with russet tips. I have seen it from southern China, Siam, Indochina, Sikkim, Borneo, Sumatra and Banka. It is homeochromic with *P. tenebricosus* var. *hoplites* de Saussure.

Polistes sagittarius var. (or subsp.) **indonesicus** new

The variety *indonesicus* is homeochromic with the typical color form of *P. tenebricosus.*

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[2] Et. Fam. Vesp., II, p. 56, 1853.

Female and Worker. Black, more or less extensively marked with ferruginous, without yellow or orange-yellow on the abdomen. Head often almost entirely ferruginous. Thorax either ferruginous with black sutures, or black with pronotum, scutellum, postscutellum and most of propodeum ferruginous. Abdomen black, with first and second tergites and second sternite partly ferruginous and the fifth and sixth usually partly or mostly of that color; first tergite sometimes with a narrow yellow margin. Legs extensively ferruginous. Wings as in typical form, strongly infuscate basally, yellowish-ferruginous apically.

Male. Similar to the female or worker, but under side of scape and inner orbits yellowish.

Holotype.—Female; Bandjar, Java, (J. van der Vecht).

Allotype.—Male; South Soekaboemi, West Preanger, Java (J. van der Vecht).

Paratypes.—JAVA: Male; Djampang Tengan. Male; Depok. Female; South Soekaboemi, West Preanger. BALI: Male. CELEBES: Female; without definite locality. Female; Patuhuang, South Celebes. Female; Latimodjong Mts., Bontoe Batoe Distr., 4500 to 6500 ft. PHILIPPINES: Female; Malampaya, Palawan. Female; Brooks Point, Palawan.

Holotype, allotype and paratypes at Museum of Comparative Zoölogy, Cambridge, Massachusetts. Paratypes also in Coll. van der Vecht; at the Philippine Bureau of Science, Manila; and at the Academy of Natural Sciences, Philadelphia. Dr. V. D. Vecht writes me that he also caught this variety in southern Sumatra (Tandjong Karang).

Polistes sagittarius var. **philippinensis** H. de Saussure

1853. *Polistes philippinensis* H. de Saussure, Et. Fam. Vesp., II, p. 58.

Head and thorax black, with few ferruginous blotches. Abdomen black, with broad, conspicuous orange-yellow (or somewhat russet) apical margins on the first four or five tergites; sixth tergite black; the orange-yellow sometimes covers half of the second tergite. Wings fairly uniformly yellowish-russet.

Known only from the island of Mindanao in the Philippines. It is homeochromic with *P. tenebricosus* var. *leopoldi* J. Bequaert (which, however, is known only from Negros) and *Vespa tropica* var. *philippinensis* H. de Saussure (known from Mindanao, Negros, Samar and Luzon).

Polistes sagittarius var. (or subsp.) **funebris** new

This is the darkest form of the species, homeochromic with *P. tenebricosus* var. *nigrosericans* J. Bequaert and *Vespa tropica* var. *deusta* Lepeletier, both of which occur in Luzon.

Female and Worker. Black, with very few russet blotches on mandibles, apex of clypeus, inner orbits, antennae beneath, hind margin of pronotum (very narrowly), scutellum, anterior margin of postscutellum, knees, tarsi, and very narrow (usually indistinct) apical margins of first two or three tergites. Wings fairly uniformly yellowish-russet. In many specimens the apical fascia of the first tergite only is distinct.

Male. Similar to the female, but legs often mostly ferruginous; under side of scape and inner orbits yellowish; sometimes apical fascia of first tergite yellowish.

Holotype, female, and *allotype,* male; Los Baños, Luzon, Philippine Islands; (F. X. Williams).

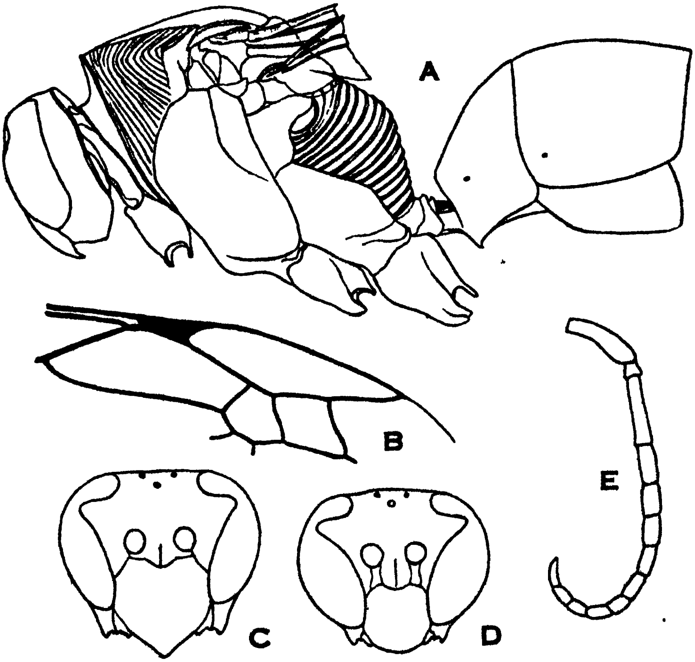
Paratypes of both sexes from Luzon: Los Baños; Mt. Banahao, Laguna; Manila; Laguna; Mt. Maquiling; Tabaco, Albay.

Holotype, allotype and paratypes at Museum of Comparative Zoölogy, Cambridge, Mass. Paratypes also at the Philippine Bureau of Science, Manila; the College of Agriculture, Laguna; the American Museum of Natural History; the U. S. National Museum; and the Academy of Natural Sciences, Philadelphia.

Polistes strigosus new species (Text-fig. 1.)

Structurally *P. strigosus* is close to *P. sagittarius,* but is readily differentiated by the shouldered and transversely ribbed pronotum. I have found no published description of *Polistes* mentioning this peculiarity.

Female. Large, stubby species. Head of normal shape, about as high as wide seen in front. Oculo-malar space moderately long, about the length of the fifth antennal segment and one-fifth of the length of the eye. Outer orbits (or cheeks) moderately swollen, slightly narrower than the eye in profile, margined behind by a sharp carina in the upper two-thirds only, the lower third evenly rounded off into the gula. Clypeus moderately convex, about as wide as long in the middle, ending anteriorly in a low, broadly triangular and bluntly rounded point; its sides contiguous with the eyes for a long distance (more than the length of the oculo-malar space). Eyes bare, about as far apart on the vertex as at the clypeus. Ocelli large, in a slightly flattened triangle; the posterior ocelli only slightly farther from the eyes than from each other. Interantennal ridge low and blunt. Antennae slender, about as far from the eyes as from each other. Mandibles of normal shape, with very sharp teeth. Thorax of the usual shape, much longer than high or wide; mesopleura without prepectal suture, but with the usual mesosternal suture; mesepisternal suture absent, the episternum of the mesopleura forming a single sclerite, sharply divided from the mesepimeron by a deep suture. Humeral margin of pronotum raised into a very high lamella, slightly higher medially and broadly rounded at the humeri; flattened, dorsal areas separated from the sloping and slightly concave sides by a blunt shoulder, which is well marked near the very strong preälar ridges and disappears gradually before reaching the humeral margin. Scutellum moderately swollen. Postscutellum flattened. Propodeum moderately sloping, with a deep and very broad concavity. Abdomen broadly fusiform, widest a little before mid-length, not compressed at apex. First tergite broad and short, abruptly truncate and vertically sloping at base, seen from above funnel-shaped and shorter than wide at apex. Legs very strong; claws of all legs symmetrical. Venation as usual; basal vein of fore wing ending in subcosta close to stigma.—Frons (from interantennal ridge to posterior ocelli) and ocular sinuses coarsely and densely punctate; inner orbits, vertex behind ocelli, outer orbits and



Text-figure 1. *Polistes strigosus* J. Bequaert, typical form: A, body of female holotype in profile; B, portion of wing of female holotype; C, head of female holotype in front view; D, head of male allotype in front view; E, antenna of male allotype.

oculo-malar spaces with few, scattering, small punctures. Clypeus smooth on the sides, microscopically punctate medially and with a few, very large, irregularly scattered punctures. Mandibles with a few medium-sized punctures. Pronotum with the anterior (prehumeral) slope smooth, impunctate; lateral and dorsal areas with about 13 to 15 very heavy, regularly transverse, rib-like striae, which run across the "shoulder"; grooves between the riblets with some irregular, shallow punctures. Mesonotum very coarsely rugoso-punctate, irregularly transversely striolate anteriorly. Scutellum, postscutellum, pleura and sternum coarsely reticulo-punctate. Propodeum with very strong, sharp and regular, rib-like striae, continuous across the concavity, about 13 or 14 in number, and a few punctures in the intervening grooves. Abdomen with microscopic punctures only. Legs and tegulae impunctate.

Male. Similar to female, except for shape of head, antennae and terminal segments of abdomen. Eyes somewhat bulging, the lower part of the face narrowed; oculo-malar space only about half the length of the fifth antennal segment. Clypeus nearly square, very slightly convex; anterior margin scarcely curved outward, the sides very broadly contiguous with the eyes (for nearly twice the length of the oculo-malar space). Outer orbits narrow, about half the width of the eye in profile. Antennae long and slender; all segments of flagellum twice as long as wide or more; thirteenth segment much longer than twelfth, nearly straight, equally wide throughout and with broadly rounded apex; under side of sixth to twelfth segments with faint longitudinal ridges (tyloïdes). Seventh sternite flat or slightly depressed, without appendages, the extreme sides of apical half slightly raised and ridge-like; middle of disk swollen into a low, blunt tubercle.

Length (h. + th. + t. 1 + 2); ♀, 16 to 17 mm.; ♂, 18 mm.; of fore wing: ♀, 19 to 21 mm.; ♂, 21 mm.

Holotype.—Female; Wong-Sa-Shui, South Kwangsi, China; (L. Gressitt).

Allotype.—Male; Yim-Na-San, East Kwantung, China; (L. Gressitt).

Paratypes.—Female; Yim-Na-San, (L. Gressitt). Female; Yen-Ping, China. Female; Hori, Formosa, (L. Gressitt). Female; Ta-Han, Hainan Island, (L. Gressitt).

Holotype, allotype and paratypes at Museum of Comparative Zoölogy, Cambridge, Mass. Paratypes also at American Museum of Natural History and U. S. National Museum.

I have seen *P. strigosus* in two color forms. In what I regard as the typical form, the body is almost entirely and uniformly dull ferruginous, with only the ocellar region, the flagellum and some of the sutures of head and thorax infuscate or black; the wings fairly uniformly infuscate with a russet tinge and very slightly paler apically.—In the male the mandibles, clypeus, lower half of face and under side of antennae are dirty yellowish. All the specimens listed above from China, Formosa and Hainan, belong to the typical form.

Typical *P. strigosus* is homeochromic with the typical color form of *P. tenebricosus* Lepeletier, with which it was no doubt confused thus far.

Polistes strigosus var. (or subsp.) **mimus** new

Female. Black, with the mandibles, apex of clypeus, base of antennae, upper outer orbits, dorsum of pronotum, tegulae, scutellum, tibiae and tarsi ferruginous-red; postscutellum and concavity of propodeum yellowish; all segments of abdomen broadly margined with yellow or orange-yellow, both dorsally and ventrally; the yellow covering the entire sixth segment and most of the first and second tergites. Wings uniformly and strongly yellowish-russet.

Holotype.—Female; Sibuyan Island, Philippines; (R. C. McGregor); [Museum of Comparative Zoölogy, Cambridge, Massachusetts].

A female, provisionally referred as *paratype* to var. *mimus*, from Kolambogan, Mindanao, Philippines, (C. S. Banks), has head, thorax and legs almost entirely black, the abdomen colored like the holotype except that the fourth to sixth segments are entirely black; wings also yellowish-russet.

A male, provisionally regarded as the *allotype* of var. *mimus*, from Mt. Maquiling, Luzon, Philippines, has head and thorax black, with face, postscutellum and most of propodeum dirty-yellowish; the abdomen black, with broad orange-yellow apical fasciae on first and second tergites only; the wings yellowish russet.

There is a possibility that the paratype and allotype may represent distinct forms, perhaps peculiar to some of the islands of the Archipelago; but with the few specimens before me, this cannot be decided.

The sporadic occurrence of a few specimens of *P. strigosus* and its var. *mimus*, raises the suspicion that these wasps may be social parasites of other *Polistes*, possibly of forms of *P. tenebricosus* or *P. sagittarius*.

NOTES AND NEW SPECIES IN THE YPONOMEUTOID GROUP

(MICROLEPIDOPTERA)

BY ANNETTE F. BRAUN
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(Text-figures)

Choreutis augustella Clarke

1933. *Choreutis augustella* Clarke, Can. Ent., LXV, p. 91.

Sixty-seven specimens of this species were reared from the Mount Baker district and the Olympic Mountains, Washington, on a variety of unrelated food plants as follows: *Arnica* (11 specimens); *Erigeron* (2 specimens); *Petasites frigidus* (2 specimens); other Composites (17 specimens); *Lupinus* (23 specimens); *Mertensia paniculata* (6 specimens); *Hydrophyllum tenuipes* (6 specimens). The *Arnica* series and twenty-one of the lupine series came from approximately the type locality of *C. augustella;* the rest from the Olympic Mountains at altitudes ranging from a few hundred feet along Barnes Creek (the *Hydrophyllum* specimens) to about 6000.

These reared series show a gradation from the light form with nearly white thorax and base of fore wing, with little contrast in the pale areas between the margins and centers of the scales, to specimens in which not only are all the scales dark fuscous centrally, but their margins smoky as well. The extreme of this color range is reached in one specimen in which the general color is blackish fuscous relieved only by a faint brownish tinge in the position of the usual olive-brown or olive-buff fascia, by a patch of more distinctly whitish-margined scales in the ocelloid region, and two white spots on costa, the first of these indicating the costal end of the " outer light narrow band " described by Clarke. In the darker specimens the metallic spots tend to shrink. In more than half of the specimens three diverging black lines lie above the ocelloid patch; in general these are more distinct in the paler specimens. In many of these reared specimens, a darker curved line broadest on dorsum crosses the pale basal area in the position of the outer margin of the brownish or ocherous basal patch of other species.

The palest specimen is a female; the darkest a male. In general, females predominate among the pale specimens (i.e. those with distinctly whitish base of fore wing) and males among the dark specimens; none of the very dark specimens is a female. Within any one reared series, if of any length, the entire color range is displayed, except in the lot reared on *Hydrophyllum* (2 ♂, 4 ♀) which are all of the small and pale form.

Expanse varies from 12 to 18 mm. for males; from 12 to 14 mm. for females. The maximum expanse is that of the darkest specimen, described above; in general males are larger than females, however the pale males are all of the same approximate expanse as females.

The extremes in color and size could easily be taken for different species, but for the characteristically marked scales, fuscous centrally with white or whitish margins, a character shared with *C. multimarginata* Braum and *C. melanifera* Keifer. Genitalic characters furnish sure discrimination.

Hilarographa youngiella Busck

1921. *Hilarographa youngiella* Busck, Can. Ent., LIII, p. 278.
1923. *Hilarographa olympica* Braun, Trans. Am. Ent. Soc, XLIX, p. 118.

I take this opportunity to record the above synonymy.

Glyphipteryx saurodonta Meyrick

1913. *Glyphipteryx saurodonta* Meyrick, Exotic Microlepidoptera, I, p. 68.

A single female specimen which I have determined as this species was taken September 19, 1938, in Lost River State Park, Hardy County, West Virginia. In this specimen, the " semioval ochreous-white spot on dorsum before middle " is absent, the ground color here merely a little paler. The spot in this position is commonly absent in other species of the genus, notably in *G. montisella* and *G. californiae*.

The hind wing is narrowly ovate, apex well rounded, outer margin broadly curved, but wing not trapezoidal; cilia about as long as the breadth of the wing; M_3 and Cu_{1a} stalked.

Cycloplasis immaculata new species

This species is at once separated from *C. panicifoliella* and the South American species by the absence of pale markings.

Head metallic blackish purple, more golden on lower part of face and here concolorous with the palpi; the very short third segment of palpi black; vertex a little paler; a collar of contrasting raised black scales behind (as in *panicifoliella* Clemens); antennae purplish black. Thorax metallic, paler and more lustrous than the head. Fore wings lustrous, unmarked, nearly black at base, shading through dark fuscous with a faint purplish luster to deep blue in the apical third. Cilia blackish. Hind wings and cilia dark gray. Legs blackish purple, femora of middle and hind pair silvery gray. Abdomen dark purple fuscous above, silvery gray beneath. Expanse: 5.5 mm.

Type.—♂; reared from a miner in leaves of *Panicum* sp., in a prairie, Delaware County, Oklahoma; imago, July 28, 1938.

Paratype.—♂; same data as the type.

Type and paratype in the author's collection.

The larval and pupal habits are identical with those of *C. panicifoliella* Clemens. The mined leaves were collected July 12, 1938. At this time the mine was shaped in a gradually enlarging trumpet, later it outwardly enlarges into a somewhat irregular blotch; at the end of the feeding period the larva cuts out a circular piece of the upper epidermis which is folded over to form a pupal chamber.

Argyresthia ruidosa new species (Figs. 5, 6, 6a)

This species is easily distinguished by the pale golden color, white head and middle of thorax, and the white stripe along dorsum, which is quite conspicuous when the insect is at rest.

Face and palpi pale golden; tuft on head white; basal segment of antenna faintly golden tinged, stalk white, conspicuously annulate with dark brown. Thorax white, tegulae only pale golden. Fore wings pale golden, with a broad white stripe along dorsum. Hind wings golden fuscous, cilia yellower. Body and legs straw yellow, except anterior tibiae and tarsi, which are brownish fuscous inwardly. Fore wings with veins R_4 and R_5 usually stalked for half or more of their length, rarely scarcely more than connate. Expanse: 10 to 12 mm.

The distinctive features of the male genitalia (Fig. 5) are the wish-bone shaped plate of the eighth segment with two long slender prongs, and the cornuti, which consist of numerous short spines arranged in two series. Female genitalia (Figs. 6 and 6a); signum spined, two diverging arms.

Type.— ♂ ; Ruidoso Canyon, Lincoln National Forest, New Mexico, June 28, 1939, amongst *Abies concolor.*

Paratypes.—14 ♂ , 6 ♀ ; Ruidoso Canyon, Lincoln National Forest, New Mexico, June 26 to July 1.

Type and paratypes in author's collection; paratypes also in the Academy of Natural Sciences of Philadelphia and in the United States National Museum.

All the specimens were taken resting or flying amongst *Abies concolor,* which is without doubt the food plant.

Argyresthia affinis new species (Figs. 7, 7a, 10)

Argyresthia affinis is nearest to *A. thuiella* Packard, and is marked very similarly to some varieties of that species. It is however a broader winged species, and lacks the luster of *A. thuiella.* It is distinguished from that species by the broad curve made by the brown scales around apex in contrast to the sharp angle in *A. thuiella,* by the white hind wings, and by genitalia. In *A. thuiella,* the plate of the eighth segment of the male (Fig. 8) is of totally different shape; the free angles of the vinculum are broadly rounded; and the cornuti consist of a closely packed bunch of less heavily chitinized spines. The spined signum of the female (Fig. 9) has two diverging arms.

Palpi white; head and tuft white; antennae whitish near base, shading outwardly to dark fuscous, with whitish annulations, apparent only on the outer two-thirds of the stalk. Fore wings pure white, with a sparse sprinkling of brown scales arranged in transverse strigae, and marked with dark brown spots and fasciae. At basal fourth of dorsum a brown spot reaching to the fold; a little farther out, a slightly oblique costal patch, its inner edge but little separated from the dorsal spot, and often obsolete on costa. At the middle of the wing an irregular fascia in general vertical, but often constricted below costa and at fold, so that its costal and dorsal extremities may appear oblique; its median part sometimes replaced by a mere sprinkling of brown scales. At two-thirds, costal and dorsal streaks unite to form an interrupted and slightly oblique fascia, with its dorsal arm farther removed from the median fascia than its costal arm. On costa beyond, two more brown spots, the second the larger, the first often obsolete. At apex a few dark brown scales arranged around the tip in a broad curve. Cilia pure white on dorsum, faintly grayish on termen, with two brown lines around apex and in upper half of termen. Hind wings and cilia white, with a very faint ocherous tinge toward apex. Legs white; fore and middle pair more or less shaded with fuscous, and tips of segments darker; hind pair with only the tips of tarsi fuscous. Abdomen fuscous above, white beneath. Fore wings with veins R_4 and R_5 stalked. Expanse: 8 to 10 mm.

Male genitalia (Figs. 7 and 7a). Distinguishing features are: anterior margin of vinculum sinuate, free lateral angles acute; cornuti a group of 6 or 7 spines; plate of eighth segment with posterior prong long, broad, anterior prongs short, slightly diverging.

Female genitalia: signum spined, one free arm only (Fig. 10).

Type.—♂; Cabin Run, Clermont County, Ohio, May 18, 1935.

Paratypes.—3 ♂, 1 ♀; same locality and date as the type; 1 ♀, Buzzard's Roost Rock, Adams County, Ohio, May 12, 1934. 1 ♀, Balltown, Nelson County, Kentucky, May 18, 1940. 2 ♂, 1 ♀, bluffs of Green River, Hart County, Kentucky, May 20, 1940.

Type and paratypes in the author's collection; paratypes also in the United States National Museum and in the Academy of Natural Sciences of Philadelphia.

All of the specimens were taken on *Juniperus virginiana,* which is without doubt the food plant.

Swammerdamia castaneae Busck

1914. *Swammerdamia castaneae* Busck, Proc. Soc. Wash., XVI, p. 148.

A typical specimen of this species was reared on river birch (*Betula nigra*), growing next to a dead chestnut, in the Cumberland Valley, Letcher County, Kentucky. It is interesting to record this—apparently forced—change of food plant.

Zelleria parnassiae new species (Figs. 1, 2)

In view of the close relationship of *celastrusella* and *parnassiae* and their conformity with the typical *Zelleria* genitalia, it seems evident that differences in palpal structure are not significant. Therefore the genus *Xyrosaris* Meyrick based principally on differences in palpal structure, should be sunk as a synonym of *Zelleria* Stainton.

Head whitish, rough-scaled above; palpi somewhat thickened and roughened with scales, especially beneath and toward apex on the third segment, but not brush-like, blackish outwardly and beneath, whitish inwardly; antennae whitish with narrow black annulations. Fore wings white, more or less clouded with blackish and golden brown patches, and marked with four longitudinal rows of black dots. One such row just within costa from base to middle of wing; a second along upper margin of cell to wing margin at three-fourths, with two dots at base of cilia on costa beyond; a third just above, and a fourth just below fold, converging at wing margin. From base of costa an oblique blackish or brownish mark to below fold; at basal fourth of dorsum, an irregular black patch to fold or a little above; at three-eighths just below costa, a large brownish cloud; beyond this on disk a pale brownish fuscous suffusion reaching up to costa at three-fourths and sometimes extends to dorsum; at the beginning of the cilia a pure white spot followed by a patch of black scales in the cilia, this in turn followed by a second smaller white costal bar; extreme tip of wing black encircled with black-tipped scales from costal bar to below apex. Usually the black patch at basal fourth of dorsum, the black costal patch before apex and the black scales at apex are the only black markings, but sometimes the cloud below costa is blackish and the outer part of the brownish suffusion forms an irregular transverse band at three-fourths. Terminal and dorsal cilia gray, with elongate white scales on termen. Hind wings and cilia gray. Legs dark gray, fore pair whitish anteriorly; hind pair with lower side and spurs whitish. Expanse: 13 to 17 mm.

Male genitalia (Fig. 1) typical of the genus; harpes rather broad, pointed, sacculus partially separate, rather heavily spined; gnathos tongue-like, smooth, ventral plate weakly chitinized; aedeagus long, bluntly pointed, cornuti a long and a shorter rod; saccus expanded into a rounded bulb distally.

Female genitalia (Fig. 2) typical of the genus; genital plate weakly chitinized, chitinized area not including the low broadly rounded ostium pads; ductus bursae enlarging to the funnel-shaped ostium; no signum.

Type.—♂; reared from a larva webbing leaves of *Parnassia fimbriata,* subalpine borders of Hoh Lake, Olympic Mountains, Washington; imago September 3, 1936.

Paratypes.—11 ♂, 12 ♀; all belonging to the same reared series as the type; imagoes emerged August 31 to September 7.

Type and paratypes in the author's collection; paratypes also in the United States National Museum, Academy of Natural Sciences of Philadelphia, California Academy of Sciences and Canadian National Collection.

The larvae were collected around the swampy margins of Hoh Lake, Olympic Mountains, Washington, August 13, 1936. The larva feeds on the upper side of the leaf, beneath a web spun across the leaf and drawing it into a cup-shaped feeding chamber. In feeding, the lower epidermis is usually left intact, but sometimes at the end of the feeding period some small holes are made.

Larva greenish, suffused with dark red, the sutures retaining more of the greenish color, tubercles dark; head and prothoracic shield black. It spins the typical *Zelleria* cocoon of fine cobwebby silk consisting of the inner spindle with outer looser envelope.

In the fore wing, veins R_4 and R_5 are stalked, veins M_2 and M_3 separate. In one fore wing of one specimen, vein R_2 is absent, but this is obviously an individual abnormality. In general aspect and wing shape, *Z. parnassiae* comes nearest to *Z. celastrusella* Kearfott, but is sufficiently distinguished from that species by the stalking of R_4 and R_5, the different palpal structure as well as by wing color and markings, and by genitalia. In male genitalic characters *Z. parnassiae* differs from *Z. celastrusella* in the shorter socii, broader harpes, shorter saccus, with bulb on shorter pedicel; in *celastrusella* the cornuti consist of two long more heavily chitinized rods. In the female, the lobes of the ovipositor are broader, the ostium pads smaller, more rounded than in *celastrusella*. The male genitalia of *Z. parnassiae* closely resemble those of the European *Z. saxifragae* Stainton on a related food plant.

Zelleria arizonica new species (Figs. 3, 3a, 4)

This species is very close in color and markings to *Zelleria haimbachi* Busck, described from New Jersey on pine, but differs from it in the much larger size, distribution of dusting, and (to judge from the description of *Z. haimbachi*) in the differently directed central longitudinal white stripe.

Face and head pure white. Labial palpi white; second segment pale yellow outwardly, dusted with dark brown scales and slightly roughened beneath; third segment with brush-like tuft of scales. Antennae white with light brown annulations. Thorax white narrowly margined with pale ocherous; tegulae pale ocherous. Fore wings pale ocherous with a broad white longitudinal stripe from base of costa along middle of wing to termen below apex, often diffusing into the ground color before reaching termen. Outer half of wing faintly dusted with pale brown scales which become denser and darker-tipped along the costal margin. These marginal dark-tipped scales form a continuous line around apex through the middle of the cilia of the termen which are otherwise pure white shading to faint fuscous ocherous at their tips. Hind wings whitish fuscous, slightly irrorated, cilia a shade darker. Legs white, the fore pair densely dusted with brown inwardly; middle and hind pair with more or less brown dusting especially on the tarsi. Abdomen whitish fuscous, tuft white. All veins of the forewing present and separate. Expanse: 16 to 17.5 mm.

Male genitalia (Fig. 4) typical of the genus; harpes elongate, pointed, sides nearly parallel; sacculus differentiated but scarcely separate; gnathos tongue-like, smooth, ventral plate weakly chitinized, distinguishable; aedeagus very long, acute at apex; cornuti two long unequal spines placed opposite to one another; saccus long, narrow, not appreciably expanded distally.

Female genitalia (Figs. 3 and 3a): chitinized area of genital plate of characteristic shape, the chitinization extending to the strongly spined ostium pads; ductus bursae spined throughout, abruptly enlarging to the parallel-sided ostium; signum a large, spined, leaf-shaped plate.

Type.—♂; Flagstaff, Arizona, August 17, 1939.

Paratypes.—3 ♂, 7 ♀; Flagstaff, Arizona, August 17 and 18, 1939.

Type and paratypes in the author's collection; paratypes also in the United States National Museum and in the Academy of Natural Sciences of Philadelphia.

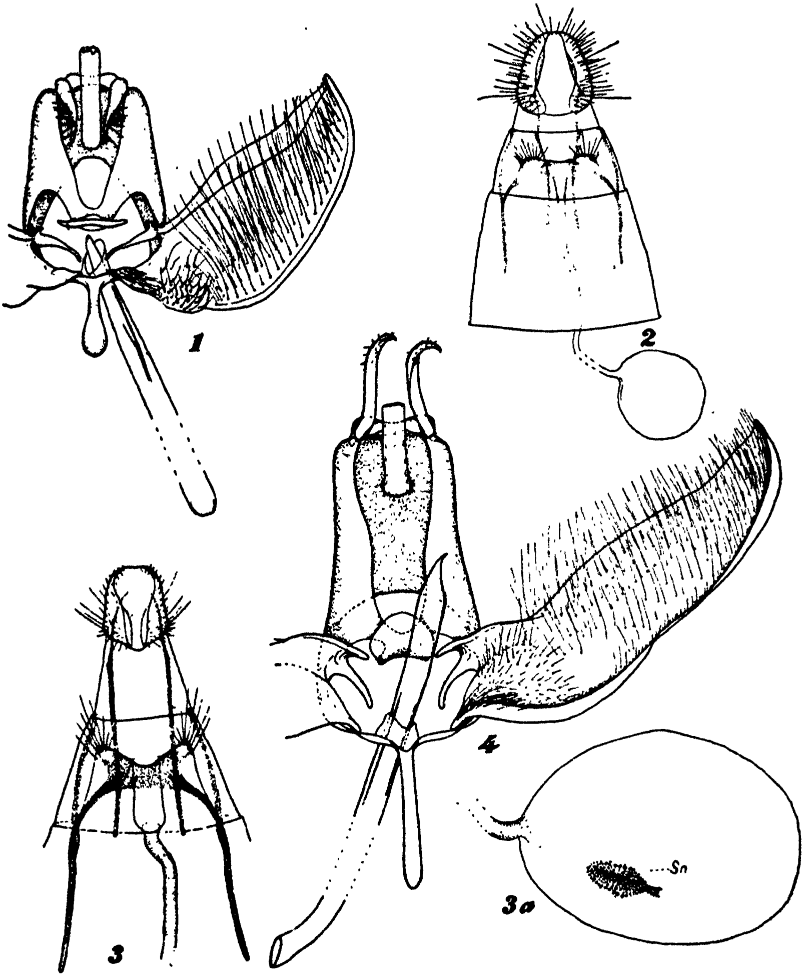
All of the specimens were collected in an area of scattered yellow pine.

The male genitalia are in accord with those of the type of the genus; the female genitalia differ in the spined ductus and the presence of a signum, characters also shown by *Z. gracilariella* Busck.

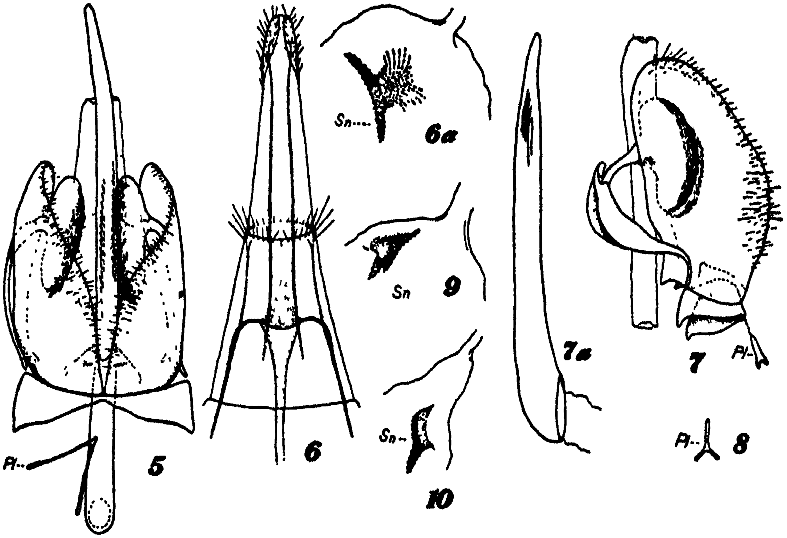
Scythris albilineata (Walsingham)

1888. *Butalis albilineata* Walsingham, Insect Life, I, p. 116.

Food plant: *Ambrosia psilostachys.* The larva draws together and webs the leaves. Larva collected September 1, 1936, Weaver Mountains, near Congress Junction, Yavapai County, Arizona; imago, September 25, 1936.



Explanation of text-figures. *Sn* = signum. Fig 1.—*Zelleria parnassiae* new species, male genitalia. Fig. 2.—*Zelleria parnassiae* new species, female genitalia. Figs. 3, 3a.—*Zelleria arizonica* new species, female genitalia. Fig. 4.—*Zelleria arizonica* new species, male genitalia.



Explanation of text-figures. *Pl* = plate of eighth abdominal segment of male. *Sn* = signum. Fig. 5.—*Argyresthia ruidosa* new species, male genitalia. Figs. 6, 6a.—*Argyresthia ruidosa* new species, female genitalia. Fig. 7.—*Argyresthia affinis* new species, male genitalia (aedeagus removed); 7a, aedeagus. Fig. 8.—*Argyresthia thuiella* Packard, three-pronged plate of eighth abdominal segment of male. Fig. 9.—*Argyresthia thuiella* Packard, signum. Fig. 10.—*Argyresthia affinis* new species, signum.

A MONOGRAPHIC STUDY OF THE SPECIES BELONGING TO THE MELYRID GENUS TRICHOCHROIDES

(COLEOPTERA)

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(Plate IX)

Collecting in recent years has brought to our laboratory, several species of Melyridae which present characters that prevent their being referred to any of the known species; these give the incentive for the present study. The basic type of structure in the several species is the same as that of the genotype. The recognition of distinct differential characters, including minor secondary sexual characters, call for the description of new species. The latter viewed from an evolutionary standpoint show differences passing from the simpler to the more complex as observed in the type species.

TECHNIQUE

Camera lucida outlines of the pronota, width of heads across the eyes, antennae and elytra have been drawn of all the species of *Trichochroides* Blaisdell. All comparative and relative statements as regards size, or length of parts have been determined from the outlines. Care has been exercised in having the axis of vision at right angles to the horizontal plane of the part under observation. Two separate combinations of lenses have been used, namely: A two-inch ocular camera lucida (Leitz) with an objective A (Zeiss) and a one-inch objective (Bausch & Lomb), so as to eliminate error by comparison. All of the illustrations of plate IX have been made with the former combination of lenses (Zeiss A); except of the pronota (figs. 1, 2, 3, and 4) with the latter combination (1-inch objective). The straight line with the figures of the antennae represent the length under lower magnification (1-inch objective).

ACKNOWLEDGMENTS

The specimens studied are, for the most part, in the collection of the Museum of the California Academy of Sciences. They are a part of the collections of J. C. Martin, A. Fenyes, E. C. Van Dyke and of the author and, those donated by E. P. Van Duzee. Series from this collection have been placed in the collection of The Academy of Natural Sciences of Philadelphia through The American Entomological Society. The author is indebted to F. W. Nunenmacher, of Piedmont, California, for the gift and loan of specimens, collected in Santa Clara County, California. To Arthur T. McClay and Richard E. Blackwelder for loan of specimens.

COMMENTS

Clean and well preserved specimens are absolutely essential to correct determination and study. This applies strongly to the Melyridae, where pubescence and maculation are important characters. Specimens which have the pubescence badly denuded or lost are worthless for study and as Museum specimens. The body form cannot supply all of the characters under such conditions. Numerous specimens come to hand·coated with extraneous material and the pubescence matted down upon the surface. Most of the specimens in the latter condition can be restored to cleanliness, by relaxing and then given a bath with gentle agitation, in equal parts of alcohol and chloroform. An attempt should be made to bring the appendages into view as they possess important characters.

In the present study it is desirable to review the generic characters, in order to facilitate their recognition without referring to other papers, as follows:

Genus **TRICHOCHROIDES** Blaisdell

Trichochroides Blaisdell, Trans. Amer. Ent. Soc., LXIV, p. 25, March, 1938.

In the males the fifth ventral abdominal segment is emarginate at apex and the disk modified to a varying degree according to the species. In the genotype *Trichochroides sexualis* Casey the secondary sexual characters are of an extreme form for the genus: The apical emargination is deep, the bottom of which is rectilinearly transverse, but the lateral concave lobes of the notch are continued on the disk past the bottom truncature, forming a rounded depression with the truncature as its apical margin, its depressed floor horizontal and flat; the surface of the segment is broadly impressed, the impression polished and impunctate toward the emargination, but elsewhere bristling with short erect black and spiculiform setae. In the female the fifth ventral segment is more or less arcuate at apex.

In part of the new species the characters are quite similar, in others the apical emargination is simple and the surface of the segment is simply impressed, without thickened margin or change in the pubescence. In two species the apex of the disk of the fourth ventral segment is involved.

The inner spurs of the anterior and middle tibiae are more or less dilated, this is probably a tribal character. The epistoma is connate with the frontal margin. The apex of the labrum is semi-circular in outline, the articulating membrane impunctate and smooth, varying in color from pale to nigropiceous. Eyes large and prominent, facets numerous, small and not noticeably setose. Antennae not or slightly serrate, moderate in length, varying in stoutness; second segment always oval and a little longer than wide; the third obconical, slender, the longitudinal surface lines straight, at times somewhat tumid apically and anteriorly with the surface lines more or less arcuate; segments four, five and six, rarely the seventh more or less compressed, the fourth triangulo-subobconical and more or less tumid anteriorly and apically; the fifth usually largest, triangular and prominent anteriorly, occasionally smaller but slightly larger than the fourth or sixth. No more than the fourth, fifth and sixth segments can be considered as slightly subserrate. Segments six to ten inclusive are more rounded in form and oval in transverse section, more or less feebly, never strongly incrassate; eleventh obovate and always longer than wide, either slightly narrower or larger than the tenth. Epipleurae moderately narrow, widest at base, thence gradually narrowing to become evanescent opposite to the fifth abdominal segment. Ungual appendages well developed, equal, as long as the claws and free at tip for a short distance.

Marginal fimbria of the pronotum and elytra long, not regular nor close set. Body invested with moderately short cinereous, fuscous or black subdecumbent pubescence, more or less abundantly intermixed with longer hispid black or paler setiform hairs.

In the Dasytini there appears to be a sixth ventral abdominal segment which is more or less visible, depending on the degree of its retraction or extension; it is evidently the sternite of the pygidial segment, for in one male the trispinous apex of the aedeagus projects from the interval above it. The part that the sternite of the sixth segment takes in the formation of the polished rectilinear transverse bottom and floor of the emargination is open for discussion. In the routine examination of specimens it has been observed that when the sixth segment (sternite) is fully extended, that there has been seen a black linear transverse ridge, basad and continuous with it a black, smooth polished surface. When retracted the sternite is in very close contact with the deeply emarginate apex of the fifth segment. A male specimen of *Trichochroides muiri* examined had the pygidial segment entirely missing, the apical emargination of the fifth ventral segment was deep, and the margin perfect and simple, the polished floor being entirely absent. Careful dissection is necessary to decide the question; to date specimens have been too scarce.

Synopsis of the Species of Trichochroides

1. Pronotal angles more or less broadly rounded 2
   Pronotal angles distinct and slightly prominent. Pronotum transverse, lateral margins arcuate in middle third, thence both apically and basally broadly and feebly sinuate to the angles. Antennae, tibiae and tarsi nigro-piceous. (Type locality: Bryson, California).
   1. *scabricollis* new speciees
2. Pronotum transverse, lateral margins thin, narrowly subexplanate and visible from above. Body broader, black, surface more or less shining; pubescence nigro-fuscous 3

Pronotum transversely oval to subcircular and smaller, often widest behind the middle; lateral marginal bead feeble, not distinctly visible from above. Body narrower and parallel 6

3. Modification of the fifth ventral abdominal segment well developed in the male 4

Modification of the fifth ventral segment more or less feeble in the male 5

4. Apex of the fifth ventral deeply emarginate, bottom of the emargination transverse, adjacent surface broadly, but not deeply impressed; floor of the impression, especially near bottom of the emargination glabrous and impunctate, bounding surface feebly raised and the punctures not denser. Antennae black, stouter in the male, moderately slender in the female; segments five and six but slightly prominent anteriorly. Tibiae and tarsi nigro-piceous. (Type locality: Dublin Canyon, Alameda County, California) ....2. *muiri* Blaisdell

Apex of fifth ventral deeply emarginate, segment moderately thickened; bottom of the emargination rectilinearly transverse; floor of the impression conspicuously smooth and shining; concave outline of the notch forming a rounded and deep depression; the declivous boundary densely punctato asperate, the rather long setae of the punctures usually decumbent and directed toward center of the floor. Antennae, tibiae and tarsi nigro-piceous. (Type locality: Mokelumne Hill, Calaveras County, California) ....3. *falsus* new species

5. Apex of fifth ventral moderately deeply emarginate, bottom of the emargination rectilinearly and transversely beaded, with a very short adjacent semilunar smooth area. Surface simply impressed, the impression finely punctate and not differing from the surrounding surface. Antennae stout, black and distinctly compressed in both sexes; tibiae in distal one-half and tarsi rufo-piceous. (Type locality: Santa Clara County, California) ....4. *nunenmacheri* new species

Apex of fifth ventral distinctly emarginate, sinus moderately broad, not deep, lateral lobes broadly arcuate; surface anterior to the sinus feebly impressed and more or less slightly glabrous, pubescence unmodified. Antennae moderately stout, outer six segments rather incrassate in both sexes, nigro-piceous; tibiae and tarsi piceous. (Type locality: Salada Beach, San Mateo County, California) ..5. *vanduzeei* Blaisdell

6. Modification of the fifth ventral feebly developed 7

Modification of the fifth ventral typically developed, *vide* generic definition. Antennae and legs black; antennae stout, compressed in the sexes. (Type locality: Marin County, California) ..6. *sexualis* Casey

7. Tibiae and tarsi rufo-testaceous. Lateral fimbria of the elytra pale ...8

Tibiae and tarsi more or less dark rufous; fimbria dark 9

8. Antennae moderately slender and more or less rufous. Fifth ventral not deeply sinuate at apex in male, adjacent surface feebly impressed; impression glabrous, with few punctures, at periphery the punctures are denser as on segment, bristling, short, erect setae entirely absent. Pubescence cinereous. (Type locality: Bear Lake, San Bernardino County, California) ....7. *palpalis* Blaisdell

Antennae stout in the male, rather slender in female, medial segments compressed. Pubescence dull cinereous and rather long. Fifth ventral segment not deeply emarginate at apex in male, bottom of the sinus transverse; surface rather broadly impressed, involving length of the segment; floor of the impression smooth, polished, black, with very few punctures centrally, these gradually become denser at the periphery, involving the apex of fourth segment; boundary of the impression slightly raised; each puncture with a short, black seta. Surrounding pubescence normal, somewhat brownish apically and on the pygidium. Elytral marginal fimbria pale. (Type locality: Lebec, Kern County, California) ....8. *crassicornis* new species

9. Fifth ventral emarginate at apex in the male, emargination not deep and semi-circularly reëntrant; impression shallow, densely punctate, punctures finely muricate, each with a short black seta. Surface not otherwise modified. Antennae slender in the sexes, rufo-piceous. A subsutural and feeble stripe of brownish hairs usually present on the elytra. (Type locality: Inyo County, California).
9. *parvicollis* new species

Fifth ventral of male not deeply emarginate and without lateral lobes, surface slightly impressed, the area slightly asperate, a small triangular smooth, shining area present, hairs short and black. Antennae moderately stout, segments more or less rufous at base and piceous apically. (Type locality: Southern California) ....10. *virilis* new species

In the comparative study of the ten species recognized at the present time, the following facts are evident: The dominant color is black. In the larger and deep black species the pubescence is black and more or less brownish (fuscous) namely: *scabricollis*, *muiri*, *falsus*, *nunenmacheri* and *vanduzęei.*

In the narrower and more slender species the pubescence present different shades of black or cinereous, tinged with plumbeous, flavous or fuscous, namely: *sexualis*, *palpalis*, *crassicornis*, *parvicollis* and *virilis*.

In *scabricollis* the pronotal angles are distinct. In all of the other nine species the angels are not prominent and distinctly rounded, the apical moderately and the basal broadly rounded and continuously so with the base.

In the larger species the pronota are transvere, varying from two-fifths, one-third to one-half wider than long; in the narrower and paler species from two-fifths to one-third.

In the larger species the lateral pronotal margin is narrowly explanate and visible from above. In the narrower species the lateral marginal bead is feeble and indistinctly visible from above.

The antennae are stouter and more compressed in *scabricollis, nunenmacheri* (moderately so in the female); males of *crassicornis, palpalis* and *vanduzeei.* Slender in both sexes of *parvicollis* and *virilis*; females of *crassicornis, vanduzeei* and *palpalis.* Moderately slender in both sexes of *muiri, sexualis* and *palpalis.*

The third antennal segment is obconical, comparatively slender, twice as long as wide at apex, with the longitudinal surface lines straight, in both sexes of *crassicornis, virilis* and *parvicollis*; females of *vanduzeei, palpalis, falsus, sexualis* and *nunenmacheri.*

The third antennal segment is more or less swollen anteriorly in apical one-half, with the surface lines more or less arcuate, both sexes of *muiri,* and *scabricollis*; males of *nunenmacheri, sexualis, palpalis* and *vanduzeei.*

Length of antennae is a little shorter than the width of the pronotum in *crassicornis, falsus, muiri,* and *vanduzeei;* equal to the width of pronotum in *virilis* and *palpalis*; width of the head in *sexualis* and a little longer than width of pronotum in male of *parvicollis*; measurements not made for *scabricollis.* Usually the antennae of the female is about the length of one segment shorter than in the male. Head small and less than the pronotal apex in *nunenmacheri.*

In *parvicollis, virilis, crassicornis* and *palpalis* the antennae may be more or less suffused with rufo-piceous, or the segments are piceous apically and rufous in basal one-third.

The tibiae and tarsi are rufo-testaceous in *palpalis* and *crassicornis*; lateral marginal fimbria of elytra pale, mixed on the pronotal margins.

Tibiae, tarsi and antennae nigro-piceous in *scabricollis, muiri, sexualis* and *falsus*; rufo-piceous in *nunenmacheri, vanduzeei, virilis; parvicolis* has the apical one-third of the anterior tibiae and tarsi rufous.

In the larger black species scattered whitish hairs may or may not be observed as follows: On the scutellum, declivous sides of the elytra and pronotal disk in *falsus*; on the declivous sides of the elytra in *scabricollis*; along the suture, laterally and apically on the elytra in *nunenmacheri;* a meager number along the suture and declivities of the elytra in *vanduzeei* and *muiri*.

In some specimens of *parvicollis, palpalis, sexualis* and *virilis* there is more or less evidence of a subsutural stripe of darker pubescence on each elytron.

Boundaries of the impressions of the fifth ventral segments in the males, distinctly modified in *sexualis, scabricollis, falsus* and *muiri*; boundaries of the impressions simple in *virilis, palpalis, nunenmacheri, vanduzeei, crassicornis* and *parvicollis*.

DESCRIPTION OF SPECIES

Trichochroides scabricollis new species (Pl. XI, fig. 1.)

Scabricollis is very distinct from the other associated species. The evident pronotal angles of the type are unique. The secondary sexual characters resemble those of *sexualis* Casey, differing only in details. The nigro-fuscous pubescence and broader form associates the species with *falsus, nunenmacheri* and *vanduzeei*.

Form elongate oblong-oval, moderate in size, somewhat depressed, two and three-fourths times as long as wide. Color black, tibiae and tarsi more or less piceous. Pubescence rather long, slender, subdecumbent and evenly distributed on the elytra; nigro-fuscous, intermingled throughout the upper surface with erect black setiform hairs of moderate length and abundance; a few ashy hairs are usually present on the declivous sides of the elytra; that of the abdomen recumbent and dark cinereous. The lateral fimbria of the pronotum and elytra are deep black and moderately long.

Head moderate in size, in width equal to the pronotal length, and one-fourth wider across the eyes than long before the post-ocular line. Frons broadly and feebly impressed, slightly tumid and smooth on the median line behind the connate epistoma, sparsely punctate centrally, denser on the vertex, punctures small; densely punctato-asperate laterally opposite the antennal insertions, sides not convex or prominent. Antennae moderate in length, about attaining the basal one-fourth of the pronotum, somewhat stout and noticeably incrassate apically, not in position for detailed study.

Pronotum transverse (Fig. 1), two-fifths wider than long, widest at the middle, base arcuato-truncate and not arcuate in circular arc; apical angles rather narrowly rounded and not prominent; sides feebly convergent anteriorly, arcuate in middle one-third, thence broadly and slightly sinuate to the angles both anteriorly and posteriorly; base one-sixth wider than apex, broadly and moderately arcuate, not noticeably sinuate laterally, angles obtuse and slightly prominent. Disk less than moderately convex, not declivous antero-laterally; punctures discrete in the central area, small and separated by a distance equal to one or two times their diameter, densely reto-asperate laterally.

Elytra oblong, sides parallel, evenly and not very obtusely rounded at apex; about one and two-thirds times as long as wide, nearly three times as long as the pronotum; base broadly emarginate and a little wider than the pronotum, humeral angles rounded, not prominent laterally and somewhat tumid; lateral margins feebly explanate, slightly reflexed, visible from above except beneath the humeri. Disk densely punctate, punctures feebly impressed, surface somewhat undulating, most so basally.

Abdomen moderately convex and densely punctate; pubescence dark cinereous and appressed, rather conspicuous at apex.

Male. Fifth ventral segment modified at middle and deeply emarginate at apex; bottom of the emargination quite rectilinearly transverse, the tumid boundary at apex is continued on the disk past the bottom of the truncature, forming a rather deep rounded depression, the latter not polished, but finely punctate, the punctures having very short setae; boundary of the depression densely punctate and bristling with erect, spiculiform black setae, with the pubescence rather conspicuous on the lobes at angles of the sinus.

Measurements: (Type) Length, 4 mm.; width, 1.9 mm.

Holotype.—Male; Bryson, Monterey County, California; May 18, 1920; (E. P. Van Duzee). [Collection, California Academy of Sciences, no. 4947].

No paratypes.

An accompanying female, also taken at Bryson, April 16, 1917 by Mr. Van Duzee, is associated with the type. It has the pronotum rather strongly convex from side to side, apical angles slightly prominent and narrowly rounded, rendering the apex feebly emarginato-arcuate between the angles; lateral margins are moderately arcuate, not sinuate anteriorly, but noticeably so posteriorly, otherwise like the type—it is probably a mate to the male.

Trichochroides muiri Blaisdell (Pl. XI, figs. 9 and 10.)

Trichochroides muiri Blaisdell, Pan-Pacific Ent., III, (4), p. 165, April, 1927.

Muiri is related to the other black and broader species, *falsus*, *nunenmacheri* and *vanduzeei*.

Form elongate oblong-suboval. Color black, tibiae and tarsi piceous to rufo-piceous, surface luster more or less shining. Pubescence of the upper surface black for the greater part, shorter hairs of the elytra subdecumbent and more or less brownish, with intermingling of longer erect hairs, those of the head and pronotum bristling. Lateral pronotal and elytral fimbria black, not forming a regular fringe.

Head as wide as the pronotal apex. Frons broadly impressed (sparsely punctate, more or less rugulose except for a feeble glabrous convexity at base of the connate epistoma.

Pronotum transverse, about one-third wider than long; apex arcuato-truncate, sides broadly arcuate and continuously so with the base, very moderately converging anteriorly to the rounded apical angles. Disk evenly and moderately convex, punctures moderate in size, sparse, separated by a distance equal to two to four times their diameter, becoming denser and punctato-reticulate in lateral fifths.

Elytra oblong-oval, broadly rounded at apex, rather more than one-half longer than wide; punctures rather coarse, separated by a distance equal to two or three times their diameter, gradually smaller toward apex, surface more or less undulating. Abdomen rather densely punctate, pubescence dull cinereous.

Male. Rather narrow and parallel. Antennae stouter (Fig. 9). Fifth ventral abdominal segment quite deeply emarginate at apex; bottom of the emargination transverse with the adjacent surface of the segment rather broadly but not deeply impressed; floor of the impression near bottom of the sinus glabrous and impunctate, punctures not dense beyond the impression.

Measurements: (Types) Length, 3 5 to 4 mm.; width, 1.3 to 1.6 mm.

Holotype.—Male; Dublin Canyon, Alameda County, California; May 6, 1917; (Frederick Muir). [Author's collection, California Academy of Sciences, no. 2714].

Allotype.—Female; with same data; June 5, 1917. [Collection Cal. Acad. Sci., no. 2715].

Paratypes.—18; with same data. Distribution: Author's collection, Cal. Acad. Sci. 8; Sugar Planters' Assoc., Honolulu, Hawaii 8. The American Entomological Society, 2.

Trichochroides falsus new species (Pl. XI, figs. 2 and 8.)

Falsus is one of the larger black species. Its secondary sexual characters are of the *sexualis* type, but differing in details; the pubescence is nigro-fuscous. *Sexualis* Casey is a much narrower species with pale pubescence.

Form elongate oblong-oval, moderately convex, two and three-fourths times as long as wide. Color black, antennae, tibiae and tarsi nigro-piceous, mandibles partly rufous. Pubescence rather short, evenly distributed, subrecumbent; black on the head and pronotum intermingled with moderately long, erect black setiform hairs; nigro-fuscous on the elytra with longer erect hairs intermixed, the latter less evident in the central area. Slender cinereous hairs invest the scutellum, also scattered on the pronotal disk and on the declivous sides of the elytra. Ventrally the pubescence is more abundant, decumbent and dark cinereous in color. Lateral fimbria of the pronotal and elytral margins long and blackish.

Head rather large, width across the eyes about equal to the pronotal apex and a little less than one-third wider than long before the post-ocular line. Frons plane, impunctate centrally behind the connate epistoma, slightly impressed each side, not prominent or convex over the antennal insertions, vertex moderately convex; surface very finely scabrous, punctures small and sparse. Antennae rather stout, moderate in length, not attaining the pronotal base; segments four to seven noticeably compressed, distal four more rounded, oval in section and rather gradually incrassate, differing more or less in the sexes.

Pronotum moderately transverse (Fig. 2), slightly more than one-third wider than long; apex arcuato-truncate, angles broadly rounded; sides evenly and rather strongly arcuate, continuously so with the base, the latter arcuate and feebly subtruncate in about middle two-fourths. Disk moderately convex, not declivous antero-laterally, punctures rather coarse, discrete in the central area and punctato-reticulate in lateral thirds. Lateral margins narrowly explanate and very feebly reflexed, the fimbria appearing to rise from the superior surface.

Elytra oblong, about one and three-fourths times as long as wide, a little less than four times as long as the pronotum; sides parallel and rather subparabolically rounded in about apical one-fourth; base broadly emarginate, slightly wider than the pronotum at middle, humeral angles evenly rounded, humeri not prominent, umbone slighty evident. Disk moderately convex, quite plane in basal one-third, sides arcuately declivous, very gradually so apically, precipitous at the humeri rendering the narrowly explanate margin invisible at that point when viewed from above; surface rather densely punctate, punctures rather coarse but gradually smaller toward apex, intervals very slightly undulating.

Abdomen moderately convex, fifth segment different in the sexes.

Male. Antennae slightly stouter (Fig. 8), third segment cylindrically obconical, twice as long as wide; fourth triangulo-obconical, slightly longer than wide at apex; fifth larger, subtriangular and prominent anteriorly; segments six to ten inclusive similar in form and length, gradually and feebly incrassate, eleventh obovate, about one-half longer than wide. Apex of the fifth abdominal segment deeply emarginate, bottom of the emargination rectilinearly transverse, floor of the impression conspicuously smooth and shining; the concave outline of the notch continued on the disk past the bottom truncature, forming a rounded and deep depression, the declivous boundary being densely punctato-asperate, punctures with rather long decumbent setae which are directed more or less toward center of the floor; the segment is moderately thickened.

Female. Head somewhat smaller, eyes rather less prominent. Antennae similar to that of the male, but a little less stout. Apex of the fifth abdominal segment arcuate.

Measurements: (Types) Length, 4.5 to 4.0 mm.; width, 1.9 to 1.5 mm.

Holotype.—Male; Mokelumne Hill, Calaveras County, California; (F. E. Blaisdell). [Author's collection, California Academy of Sciences, no. 4948].

Allotype.—Female; with same data, except collected in April. [Author's collection, Cal. Acad. Sci., no. 4949].

Paratypes.—None.

Trichochroides nunenmacheri new species (Pl. XI, figs. 11 and 12.)

Form elongate oblong-oval, moderately large and convex, about two and two-third times as long as wide. Color deep black, polished, distal one-half of the tibiae and tarsi rufous. Pubescence not dense, slender, moderately short, subdecumbent; color nigro-fuscous to black on the elytra, with a few whitish hairs along the suture and scattered erect darker hairs, especially laterally and apically. On the head and pronotum there are many dark, erect and bristling longer setae. Lateral fimbria of the pronotum and elytra moderately long. Ventral surface clothed with decumbent, dull cinereous pubescence.

Head moderate in size, width across the eyes equal to the pronotal length and about one-third wider than long before the post-ocular line. Frons plane, impunctate centrally and slightly tumid on the median line behind the connate epistoma, feebly impressed each side, not prominent laterally nor convex over the antennal insertions; surface extremely finely punctato-rugulose, vertex moderately convex. Antennae stout, moderate in length, about attaining the pronotal base, differing in the sexes.

Pronotum about one-half wider than long, transverse, apex arcuato-truncate in feeble circular arc, apical angles well rounded; sides evenly, strongly and broadly arcuate, continuously so with the moderate arcuate base, feebly convergent anteriorly. Disk quite evenly and moderately convex, punctures small in the central area, well defined and discrete, separated by a distance equal to three or four times their diameter, reto-rugulose in about lateral fourths; lateral margins narrowly explanate and slightly reflexed, visible from above.

Elytra oblong, about one and two-thirds times as long as wide, sides parallel, rather subparabolically rounded in apical fourth, sutural angles rounded; base feebly and broadly emarginate, humeral angles evenly rounded, humeri not prominent, slightly tumid. Disk somewhat plane in basal one-third, moderately convex and arcuately declivous laterally, abruptly so at the humeri, very gradually and arcuately so in apical one-third; lateral margin narrowly explanate and very slightly reflexed; surface densely punctate, punctures impressed, coarse, larger in the basal area. smaller toward apex, intervals feebly undulating in the basal area.

Abdomen moderately convex and densely punctate, punctures small, pubescence cinereous.

Male. Antenna rather stout and slightly incrassate apically (Fig. 11), third segment obconical, slightly stout and somewhat tumid anteriorly in apical one-half, about one-fourth longer than wide; fourth a little wider, subtriangular and more prominent anteriorly than the third, about one-half longer than wide, equal in length to the fifth; the latter largest, excepting the tenth, triangular and most prominent anteriorly near apex, as wide as long; segments six, seventh and eighth slightly smaller; ninth and tenth larger, the ninth similar to the preceding three, tenth subquadrate and one-third wider than the ninth; eleventh obovate and twice as long as wide, about equal in length to the preceding two taken together.

Fifth ventral abdominal segment moderately deeply emarginate at apex, bottom of the emargination rectilinearly and transversely beaded, with a very short adjacent semilunar smooth area; surface simply impressed, the impression finely punctate and not differing from the general surface.

Female. Pronotal disk somewhat declivous antero-laterally. Antennae slightly less stout (Fig. 12) and about the length of the last segment shorter than in the male; eleventh segment not as wide as the tenth; third subcylindrically obconical, widest at apex, twice as long as wide, surface lines straight; other segments similar to those of the male but slightly smaller. Apex of the fifth ventral abdominal segment arcuate.

Measurements: (Types similar in size) Length, 3.5 mm.; width, 1.5 mm.

Holotype.—Male; Santa Clara County, California; April 17, 1938; (F. W. Nunenmacher). [Author's collection, California Academy Sciences, no. 4950].

Allotype.—Female; with same data. [Author's collection, Cal. Acad. Sci., no. 4951].

Paratypes.—4 specimens with same data. Distribution: Author's collection, Cal. Acad. Sci., 1 female; Nunenmacher's collection, males 2, female 1, collected in April and May, 1938. The American Entomological Society, 1.

Trichochroides vanduzeei Blaisdell (Pl. XI, figs. 4, 15 and 16.)

Trichochrous vanduzeei Blaisdell, Trans. Amer. Ent. Soc., XLIX, p. 322, Feb. 28, 1934.

It is one of the larger and black species, the sides of the pronotum are not usually evenly arcuate, but slightly straighter or very feebly sinuate in posterior third, rendering the sides slightly more prominent just behind the middle. It is to be noted that the antennae, tibiae and tarsi are more or less rufo-piceous and that the modification of the fifth ventral abdominal segment is of a simpler type, the bounding surface of the impression not modified.

Form elongate, parallel and moderately convex. Color deep black, shining and with a more or less aeneous or purplish luster; antennae, tibiae and tarsi slightly rufo-piceous. Pubescence of the superior surface nigro-piceous and rather sparse; on the elytra the shorter hairs are more or less semierect and, along the declivous sides may become somewhat cinereous, intermixed with long and more or less erect setae; on the head and pronotum the hairs are longer and more bristling and the lateral fimbria are quite long forming a loose fringe.

Head subequal in width to the pronotal apex, the muzzle is triangular and rather short, sides not prominent laterally nor convex over the antennal insertions. Frons plane, glabrous on the median line against the base of the connate epistoma, lateral impressions broad and shallow; surface sparsely and moderately finely punctate, longitudinally rugulose against the eyes. Antennae moderate in length, about attaining the pronotal base and a little shorter than the pronotal width, differing more or less in the sexes.

Pronotum about one-third wider than long (Fig. 4), apex subtruncate, angles obtuse and moderately rounded; sides subparallel, arcuate, somewhat widest at posterior third, slightly convergent anteriorly, feebly sinuate or somewhat straighter and slightly converging in posterior one-third to base, the latter broadly arcuate, angles broadly rounded. Disk moderately convex, punctures rather coarse in the central area, separated by a distance equal to about twice their diameter, laterally distinctly reticulo-punctate.

Elytra a little less than twice as long as wide, about three times as long as the pronotum, parallel, apex rather broadly and the sutural angles very narrowly rounded. Disk moderately convex, less so in basal one-third, rather strongly and arcuately declivous laterally, gradually so apically, margins narrowly explanate and slightly reflexed; surface rather coarsely punctate, punctures separated by a distance equal to three times their diameter, intervals finely undulating.

Abdomen densely and rather finely punctured, pubescence more or less dull cinereous.

Male. Somewhat narrower. Antennae stouter (Fig. 16), third segment thicker, obconical, a little longer than wide, surface lines arcuate; fourth obconico-subtriangular, noticeably compressed, surface lines straight, about as long as wide; fifth triangular, largest except the distal three, distinctly prominent anteriorly in apical one-half, somewhat constricted at base, as long as wide; segments six to the tenth more rounded and oval in section, sixth slightly smaller, seventh, eighth and ninth quite equal in length, ninth and tenth slightly wider and feebly subtriangular, eleventh obovate and about twice as long as wide.

Fifth ventral abdominal segment distinctly emarginate, the sinus moderately broad, bottom of which is transverse and slightly arcuate, lateral lobes broadly arcuate; surface anterior to the sinus feebly impressed and more or less glabrous, pubescence unmodified; pygidial segment densely clothed with black hairs.

Female. Slightly broader. Antennae more slender (Fig. 15), third segment obconical, rather slender with surface lines straight, fourth obconical, slightly stouter with surface lines arcuate; fifth larger, triangular and prominent at middle anteriorly, other segments similar to those of the male but a lttle narrower, the eleventh somewhat elongate oval. Fifth ventral abdominal segment broadly arcuate at apex.

Measurements: (Types) Length, 3.1 to 4.0 mm.; width, 1.4 to 1.6 mm.

Holotype.—Male; Salada Beach, San Mateo County, California; April 21, 1918; (E. P. Van Duzee). [Collection of the California Academy of Sciences, no. 2693].

Allotype.—Female; with same data. [Cal. Acad. Sci., no. 2694].

Paratypes.—6 specimens with same data. Distribution: Collections of the California Academy Sciences and that of the author, 3; and The American Entomological Society, 3.

Vanduzeei has also been taken at Bryson, Monterey County, California, on April 26th.

Trichochroides sexualis (Casey) (Pl. XI, figs. 5 and 6.)

Trichochrous sexualis Casey, Annals N. Y. Acad. Sci., VIII, p. 524, July 1895. Coleop. Notices, VI.

Trichochroides sexualis Blaisdell, Trans. Amer. Ent. Soc., LXIV, p. 25, 1938.

Form elongate, moderately convex, polished and deep black without metallic reflection; antennae and legs black. Pubescence rather short, coarse, subdecumbent, luteo-cinereous, sparsely and evenly distributed on the elytra; intermingled throughout above with erect black setae, which are moderate in length and abundance. Pubescence of the ventral surface recumbent and cinereous.

Head four-fifths as wide as the pronotum, frons plane, smooth on the median line behind the base of the connate epistoma, lateral impressions feeble, sides not prominent nor convex over the antennal insertions; finely and sparsely punctate, feebly rugulose especially toward the sides; articulating membrane smooth and somewhat pale. Antennae moderately slender, a little longer than width of the pronotum, not serrate, differing slightly in the sexes.

Pronotum transverse, one-half wider than long; apex arcuato-truncate in feeble circular arc, angles moderately broadly rounded; sides strongly and broadly arcuate toward base, gradually convergent and feebly arcuate toward apex; base broadly arcuate and continuously so with the sides, the angles sometimes very obtuse but not wholly obliterated. Disk moderately convex, finely and sparsely punctate, coarsely reto-rugose near the sides; marginal bead fine and not distinctly visible from above.

Elytra three-fifths longer than wide and two and one-half times as long as the pronotum, slightly wider than prothorax, parallel and straight at the sides, evenly and not very obtusely rounded at apex. Disk somewhat coarsely, strongly and sparsely punctate, the punctures impressed.

Abdomen finely punctate and not strongly convex.

Male. Somewhat narrower. Antennae slightly stouter (Fig. 6), second segment slightly elongate, third and fourth subobconical, slightly stout, as long as wide, surface lines arcuate; fifth largest, a little longer than wide in apical one-third, where it is most prominent anteriorly, subtriangular; segments six to the tenth inclusive not incrassate, of equal length and more rounded, the tenth being slightly stouter; eleventh obovate, twice as long as wide. Fifth ventral abdominal segment modified and a generic character (*vide supra*).

Female. Head and prothorax slightly smaller compared with the elytra, although not differing much in their own individual form or size; the elytra are however distinctly broader and relatively shorter. Antennae very slightly less stout (Fig. 5), second segment oval as usual, third and fourth obconical, somewhat slender, twice as long as wide, the surface lines straight; fifth segment subtriangular, smaller than in the male and obtusely prominent anteriorly, sixth slightly prominent anteriorly, distal segments similar to those of the male. Fifth ventral segment arcuate at apex.

Measurements: (Types, *vide* Casey) Length, 2.7 to 3.0; width, 1.05 to 1.2 mm.

Type.—Male; Sonoma County, California. [Casey collection, United States National Museum].

Sexualis occurs quite commonly in Marin County, California, on the blossoms of a shrub growing on Mt. Tamalpais. In some specimens there is a more or less evident subsutural stripe of blackish hairs on each elytron.

Trichochroides palpalis (Blaisdell) (Pl. XI, fig. 7.)

Trichochrous palpalis Blaisdell, Trans. Amer. Ent. Soc., XLIX, p. 321, Feb. 28, 1923.

Palpalis is to be recognized by the secondary sexual characters and pubescence. The lateral fimbria of the elytra are pale, the tibiae and tarsi are rufo-testaceous; antennae stouter in the male, in length equal to width of pronotum. Occasional specimens show a feeble subsutural stripe of brownish or blackish hairs on each elytron, in this character resembling some specimens of *parvicollis, sexualis* and *virilis.*

Form moderately narrow oblong-oval, convex, less than three times as long as wide. Color deep black, at times with a slight aeneous luster; antennae more or less suffused with rufous or the basal segments pale and the distal segments piceous and paler in basal one-third, mouth-parts varied with rufous, tibiae and tarsi rufo-testaceous. Pubescence dual, consisting of semi-erect and bristling hairs. Semi-erect hairs very sparse, brownish or brownish-gray in color, rather long and slightly coarse; bristling hairs black, erect, long and rather coarse. Pronotal marginal fimbria blackish, those of the elytra pale.

Head about four-fifths as wide as the pronotum, frontal impressions broad and shallow, separated by a median feebly convex area at the epistomal base; surface distinctly reticulate, punctures sparse, well defined and moderate in size. Antennae differing moderately in the sexes.

Pronotum about one-half wider than long, apex arcuato-truncate, angles moderately rounded; sides more or less evenly arcuate from base to apex or less so anteriorly and posteriorly, being subangulate behind the middle; basal angles broadly rounded. Disk moderately convex, punctures very sparse, sharply defined and the intervals smooth and polished in the central area, coarsely and distinctly reticulate in lateral fourths.

Elytra oblong, nearly parallel, about twice as long as wide; humeri rather prominent; surface smooth and shining, apex rather broadly and evenly rounded; punctures large and rather coarse, unevenly distributed; surface somewhat transversely rugose between the almost transversely arranged punctures, the latter smaller and smoother toward apex.

Abdomen finely and densely punctate, pubescence cinereous, abundant and decumbent.

Male. Narrower. Pronotum as wide as or slightly wider than the elytra, sides sometimes subangulate just behind the middle. Antennae stouter (Fig. 7), segments four, five and six compressed; the third obconical and slightly swollen apically, surface lines somewhat arcuate; fourth obconico-triangular, surface lines straighter, fifth largest, triangular and prominent anteriorly at middle; distal segments more rounded, as long as wide, seventh slightly smaller, last three slightly larger. Fifth ventral abdominal segment sinuato-truncate at apex; surface opposite the sinuation impressed, the impression glabrous and with few scattered punctures, at the periphery of the impression the punctures are noticeably dense and the hairs more numerous.

Female. Body broader and the elytra slightly wider than the pronotum; sides of the latter broadly and evenly arcuate, angles as in the male. Fifth ventral abdominal segment not very strongly arcuate at apex.

Measurements: (Types) Length, 2.9 to 3.1 mm.; width, 1.0 to 1.1 mm.

Holotype.—Male; Bear Lake, San Bernardino County, California; June 5, 1919; (J. O. Martin). [Collection of J. O. Martin, California Academy Sciences, no. 2691].

Allotype.—Female; with same data. [Cal. Acad. Sci., no. 2692].

Paratypes.—9 specimens with same data. Distribution: Collections of J. O. Martin, California Academy Sciences, 7; and The American Entomological Society, 2.

Trichochroides crassicornis new species (Pl. XI, figs. 13 and 14.)

Form elongate oblong-oval, sides parallel, rather small in size and about three times as long as wide. Color black, distal three-fourths of the tibiae, tarsi, trochanters and antennae, more or less rufous, mouth-parts varied with the same. Pubescence moderately abundant, rather long, shaggy and cinereous on the upper surface; shorter hairs of the elytra loosely decumbent, those of the head and pronotum similar in color; throughout sparsely intermixed with erect black setae; at sides of the elytra a varying number of the setae are pale. Lateral pronotal fimbria of the pronotum and elytra long, on the former black intermingled with pale setae, on the latter pale. Pubescence of the ventral surface moderately long, slender, recumbent but not closely appressed; more abundant on the abdomen than on the sterna and parapleurae.

Head moderately small, muzzle somewhat short, about one-third wider across the eyes than long before the post-ocular line. Frons smooth and shining, very feebly convex, slightly tumid and impunctate on the median line behind the connate epistoma, broadly and slightly impressed laterally, not in the least convex or prominent over the partly exposed antennal insertions, vertex moderately convex; surface very finely punctato-rugulose, punctures small and sparse. Antennae differing somewhat in the sexes.

Pronotum comparatively small, about one-third wider than long, apex arcuato-truncate in feeble circular arc, angles rounded; sides arcuate and continuously so with the base, somewhat less so anteriorly and convergent, appearing slightly widest behind the middle; marginal bead poorly defined and not in the least explanate. Disk evenly convex, feebly declivous antero-laterally; punctures small and discrete, separated by a distance equal to two or three times their diameter; surface shining, slightly irregular in the central area and punctato-reticulate in lateral thirds.

Elytra oblong-suboval, about three times as long as the pronotum and three times as long as wide; base very feebly emarginate, humeral angles evenly rounded, humeri not in the least prominent, not noticeably tumid; sides parallel, rather broadly rounded in apical fourth, sutural angles narrowly rounded. Disk moderately convex, arcuately and somewhat precipitous laterally, gradually and arcuately so apically, marginal bead feeble, not in the least explanate nor visible from above at the humeri; punctures rather dense, separated by a distance equal to one or two times their diameter, somewhat impressed toward the base, smaller apicad, intervals irregularly undulating, most so basally.

Abdomen moderately convex, finely and densely punctate. Legs moderate in length.

Male. Narrower. Antennae moderately stout (Fig. 13), moderate in length and about attaining the basal fourth of the pronotum; segments noticeably compressed beyond the third; the distal three gradually less so and more oval in section, subequal in length and subtriangulo-oval in form; third segment stouter than in the female, twice as long as wide at apex, fifth subtriangular and a little more prominent anteriorly; eleventh obovate and one-half longer than wide. Fifth ventral abdominal segment not deeply emarginate at apex, bottom of the sinus transverse; surface rather broadly impressed, impression shallow, involving the length of the segment, its floor smooth and polished, centrally with very few punctures, which gradually become dense at the periphery; apex of the fourth segment similarly punctate, each puncture with a black seta; boundary of the impression slightly raised, surrounding pubescence not modified, somewhat brownish apically and on the pygidium.

Female. Somewhat broader. Antennae moderately slender (Fig. 14), third segment cylindrico-obconical, twice as long as wide; segments four to ten inclusive rather less rounded and more narrowed basally, fifth very slightly more elongate, triangular and slightly prominent anteriorly at middle. Apex of the fifth ventral moderately arcuate.

Measurements: (Type) Length, 4 mm.; width, 1.4 mm.

Type.—Male; Lebec, Kern County, California; May 15, 1928, alt. 4000 ft.; (J. O. Martin). [Author's collection, California Academy Sciences, no. 4952].

Paratypes.—4 males, 1 female, with same data. Distribution: Collection of Cal. Acad. Sci., 2; and The American Entomological Society, 3.

The female in very poor condition.

Trichochroides parvicollis new species (Pl. XI, fig. 18.)

Form elongate, parallel, size small, three times as long as wide. Color black, shining and with a slight bluish tinge; antennae, middle and posterior tibiae and tarsi more or less rufo-piceous; anterior tibiae in apical third and tarsi rufous, mouth-parts varied with rufous. Pubescence sparse, moderate in length, very slender, semi-decumbent; on the elytra cinereous along the suture and laterally, each elytron with a rather broad inconspicuous subsutural stripe of fuscous hairs; on head and pronotum the hairs are nigro-fuscous; throughout the upper surface sparsely intermixed with long erect setae, which are nigro-fuscous on the elytra, black and bristling on the head and pronotum. Lateral marginal fimbria of the pronotum and elytra black, long and not closely spaced. Pubescence of the ventral surface rather abundant, fine and long on the abdomen, dark plumbeo-cinereous in color.

Head relatively moderate in size, across the eyes as wide as the pronotal apex and one-fourth wider than long before the post-ocular line. Frons plane and with a median rounded and tumid impunctate area behind the connate epistoma; surface slightly impressed laterally, sides not prominent nor convex over the more or less exposed antennal insertions; densely and finely punctato-scabrous, vertex moderately convex. Antennae slender, not in the least serrate, in length about attaining the pronotal base, differing moderately in the sexes.

Pronotum about one-third wider than long, subcircular in outline, apex arcuato-truncate in moderate circular arc, apical angles well rounded; sides broadly arcuate and continuously so with the moderately arcuate base; lateral marginal beads feeble. Disk moderately convex, somewhat arcuately declivous antero-laterally, sparsely punctate in the central area, punctures small, discrete and separated by a distance equal to four or five times their diameter, densely scabrous in lateral thirds.

Elytra oblong-suboval, one and one-half times as long as wide and three times as long as the pronotum; sides parallel and quite parabolically rounded at apex; base feebly emarginate, humeral angles rounded, humeri not prominent, feebly tumid. Disk moderately convex, rather rapidly and arcuately declivous laterally, gradually so apically; marginal bead feeble and not in the least explanate.

Abdomen moderately convex, finely and densely punctate.

Male. Narrow and parallel. Antennal segments relatively small (Fig. 18), each more or less rufous at base; third obconical, twice as long as wide at apex, very feebly swollen anteriorly at apex, fourth subtriangulo-obconical; fifth triangular, prominent anteriorly at middle, as long as wide and but slightly larger than the fourth of following segments; six, seven and eighth as long as wide, feebly more prominent anteriorly than posteriorly and oval in transverse section; segments ninth and tenth slightly larger, almost subquadrate and as long as wide, eleventh relatively small and one-half longer than wide. Fifth ventral abdominal segment moderately emarginate at apex, sinus arcuately reëntrant at bottom, adjacent surface impressed, impression black, densely punctate, punctures rather finely muricate, each with a short black seta, surface not otherwise modified. Legs moderate in length; metatarsi slightly shorter than their tibia.

Female. Relatively broader. Antennae more slender with segments less prominent anteriorly, more or less rufous in color; tibiae, tarsi, trochanters and mouth-parts more rufous.

Measurements: (Type) Length, 3 mm.; width, 1.0 mm.

Type.—Male; Independence, Inyo County, California, 1919. [Author's collection, California Academy of Sciences, no. 4953.]

Paratype.—1 female; with same data. Placed in the collection of The American Entomological Society.

Trichochroides virilis new species (Pl. XI, figs. 3 and 17.)

Virilis is to be recognized by secondary sexual characters, pubescence, rufo-piceous tibiae and tarsi and, the slender antennae of both sexes that are more or less suffused with rufous. The head and pronotum are somewhat punctato-scabrous.

Form comparatively narrow, elongate, sides parallel, nearly three times as long as wide. Color black, mouth-parts more or less rufo-piceous; antennae suffused with rufous or distal segments more or less piceous apically and rufous basally; tibiae blackish in basal fourth, thence with the tarsi rufous. Head and pronotum shining and with a slight bluish tinge. Pubescence of elytra rather long, semi-erect and dull flavo-cinereous, sparsely intermixed with blackish erect slender hairs, at times there is more or less evidence of a subsutural stripe on each elytron; head and pronotum with a varying number of pale hairs and more evident erect blackish setae. Ventral surface clothed with fine appressed hairs, rather loosely so on the abdomen and plumbeo-cinereous in color. Marginal fimbria of pronotum and elytra long and black, intermixed with pale setae in the humeral region.

Head comparatively small, in width equal to the pronotal apex, about a third wider than long before the post-ocular line, muzzle rather short. Frons plane, except a small median impunctate and tumid area behind the connate epistoma; very feebly impressed each side and not convex over the antennal insertions, surface finely scabrous, punctures small and very sparse. Antennae moderately slender in both sexes (Fig. 17, male), about attaining the pronotal base; third segment obconical, twice as long as wide with the longitudinal surface lines straight; segments four to seven inclusive moderately compressed, the fourth obconical and broader with surface lines arcuate, about one-third longer than wide at apex, fifth larger and about size of tenth, subtriangular and prominent anteriorly at middle, slightly longer than wide; segments six to ten inclusive quite equal in length and more rounded, comparatively small and gradually and very slightly incrassate; eleventh obovate, twice as long as wide and a little narrower than tenth.

Pronotum about one-third wider than long (Fig. 3), widest just behind the middle, apex truncato-arcuate, angles moderately well rounded; sides arcuate, less so and slightly convergent anteriorly, rather strongly so posteriorly and continuous with the arcuate base. Disk moderately convex, slightly declivous antero-laterally, punctures small, distinct, discrete in the central area and separated by a distance equal to two or three times their diameter, intervals smooth centrally, punctures denser and scabrous laterally.

Elytra oblong, about one and four-fifths times as long as wide and three times as long as the pronotum; base slightly emarginate. Humeral angles rounded and not prominent; sides parallel, subparabolically rounded in apical fourth, sutural angles narrowly rounded. Disk feebly convex, arcuately declivous laterally, very gradually so apically, precipitous at the humeri, humeral umbones smooth and slightly tumid, margins not explanate; punctures small, separated by a distance equal to three or four times their diameter, smaller toward apex, intervals more or less slightly undulating. Scutellum subquadrate.

Abdomen moderately convex and densely punctate.

Male. Usually narrower and smaller. Apex of the fifth ventral abdominal segment not deeply emarginate, adjacent surface of the segment impressed in middle third; impression rather shallow, its surface more or less punctate, punctures finely submuricate, each with a very short black seta, which also involve the apex of fourth segment; margins of the impression not modified and simple as on the general surface, its floor slightly smooth and shining. Legs moderate in length, meta-femora not swollen; meta-tibiae and tarsi quite equal in length. Fifth ventral segment three-fourths longer than fourth.

Female. Usually a little wider and larger. Apex of the fifth ventral segment arcuate.

Measurements: (Type) Length, 3 mm.; width, 1.0 mm.

Type.—Male; Sierra Madre, Los Angeles County, California; May; (Dr. A. Fenyes). [Fenyes collection, Museum California Academy Sciences, no. 4954.]

Paratypes.—13; Sierra Madre, Los Angeles County, 2, [1 in the Fenyes Collection]. Los Angeles County, April 9, 1923, (Warwick Benedict), 1. Santa Anita Cȧnyon. Los Angeles County, (J. O. Martin), April 11, 1916, 8. Mt. Lowe, 1. Pasadena, California, 1. Distribution: California Academy of Sciences, 9; The American Entomological Society, 4.

EXPLANATION OF PLATE IX

Note.—The straight line accompanying most of the figures represent a lower magnification (1 inch obj.), the same as that for figures 1 to 4. The other figures have a higher magnification (obj. A (Zeiss)).

Fig. 1.—Pronotum of *Trichochroides scabricollis* new species, male. (Note width of head across the eyes as compared to width of pronotal apex.) [Type locality: Bryson, Monterey County, California.]

Fig. 2.—Pronotum of *Trichochroides falsus* new species, male. (Note width of head and elytral base.) [Type locality: Mokelumne Hill, Calaveras County, California.]

Fig. 3.—Pronotum of *Trichochroides virilis* new species, male. [Type locality: Sierra Madre, California.]

Fig. 4.—Pronotum of *Trichochroides vanduzeei* Blaisdell, male. [Type locality: Salada Beach, San Mateo County, California.]

Fig. 5.—Right antenna of *Trichochroides sexualis* Casey, female. [Type locality: Mt. Tamalpais, Marin County, California.]

Fig. 6.—Right antenna of *Trichochroides sexualis* Casey, male. [Type locality: Mt. Tamalpais, Marin County, California.]

Fig. 7.—Right antenna of *Trichochroides palpalis* Blaisdell, male. [Type locality: Pasadena, California.]

Fig. 8.—Right antenna of *Trichochroides falsus* new species, male. [Type locality: Mokelumne Hill, Calaveras County, California.]

Fig. 9.—Left antenna of *Trichochroides muiri* Blaisdell, male. [Type locality: Dublin Canyon, Alameda County, California.]

Fig. 10.—Left antenna of *Trichochroides muiri* Blaisdell, female. [Type locality: Dublin Canyon, Alameda County, California.]

Fig. 11.—Right antenna of *Trichochroides nunenmacheri* new species, male. [Type locality: Santa Clara County, California.]

Fig. 12.—Right antenna of *Trichochroides nunenmacheri* new species, female. [Type locality: Santa Clara County, California.]

Fig. 13.—Left antenna of *Trichochroides crassicornis* new species, male. [Type locality: Lebec, Kern County, California.]

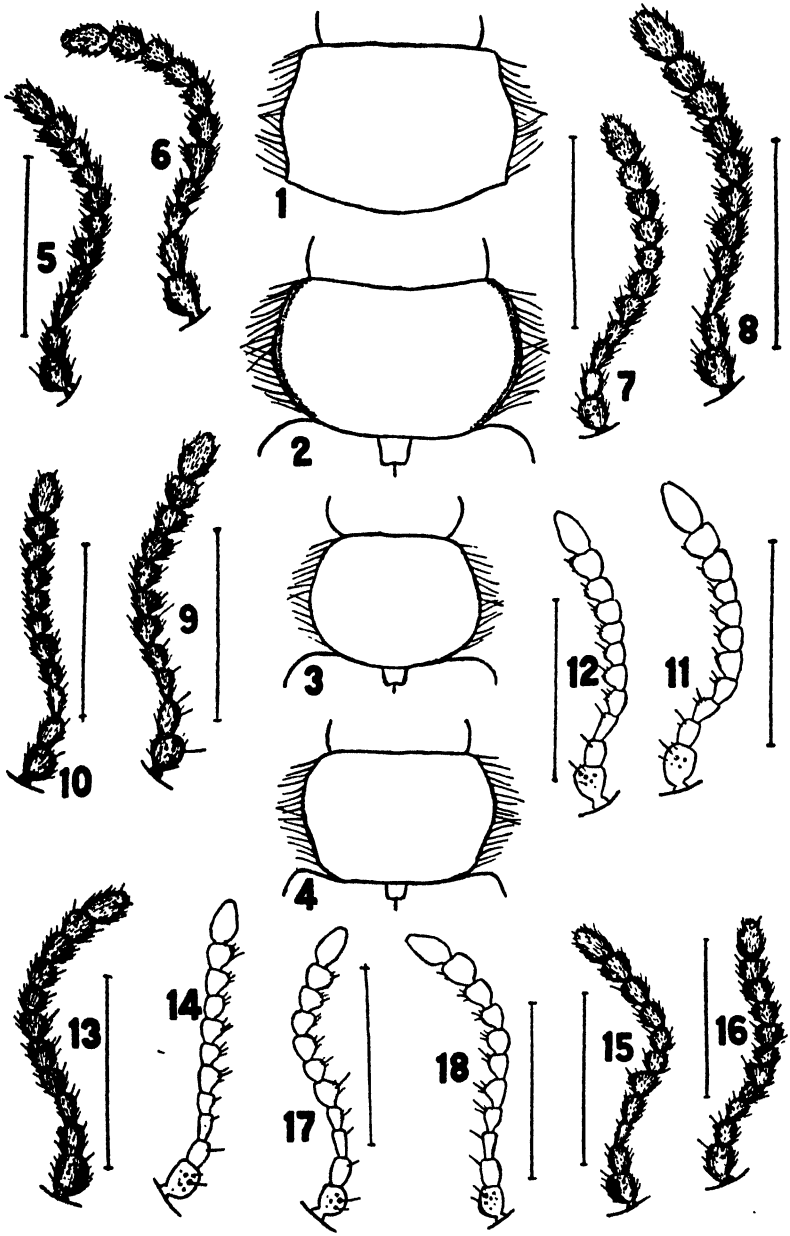
Fig. 14.—Left antenna of *Trichochroides crassicornis* new species, female. [Type locality: Lebec, Kern County, California.]

Fig. 15.—Right antenna of *Trichochroides vanduzeei* Blaisdell, female. [Type locality: Salada Beach, San Mateo County, California.]

Fig. 16.—Right antenna of *Trichochroides vanduzeei,* Blaisdell, male. [Type locality: Salada Beach, San Mateo, California.]

Fig. 17.—Left antenna of *Trichochroides virilis* new species, male. [Type locality: Sierra Madre, Los Angeles County, California.]

Fig. 18.—Right antenna of *Trichochroides parvicollis* new species, male. [Type locality: Independence, Inyo County, California.]



BLAISDELL—TRICHOCHROIDES

A REVISION OF THE GENUS OREOPASITES

(HYMENOPTERA: NOMADIDAE)[1]

BY E. GORTON LINSLEY

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(Text-figure)

Oreopasites Cockerell is the only North American representative of the Old World tribe Ammobatini. The genus is apparently restricted to western North America with most of the known forms occurring in California. Although the species are rare in collections, they may frequently be captured in numbers flying about the nesting sites of their host bees of the genus *Nomadopsis* (Panurgidae).

Like many other parasitic bees, the species and subspecies of *Oreopasites* are not always equally distinguishable in the two sexes. Also, since the various host species of *Nomadopsis* differ markedly in size as well as in the volume and character of the pollen stored for food, it may be suspected that the host may exert some influence upon the external characters of the parasites. At present, there is no evidence to indicate the nature or extent of this influence, if any, and the interpretation of species in this group is therefore difficult. However, for the purposes of the present study, a series of individuals from one host, exhibiting small but relatively constant differences from those occurring on another host or in another area, have been regarded as subspecies although it is recognized that when more exact knowledge is available, it may be necessary to change the status of some of these forms either to species or to host varieties.

In the material at hand, two groups of species are evident. The first of these, the *vanduzeei*-group, is characterized by an elevated, V-shaped, pubescent, subapical collar on the fifth abdominal sternite of the female and by the dull or moderately shining mesoscutum which is usually pubescent and closely, rather regularly punctate. The *scituli*-group lacks the elevated sternal collar but has a shining, longitudinal keel-like ridge at the apex of the fifth sternite (lacking only in *euphorbiae*) and the mesoscutum is highly polished, sparsely and irregularly punctate and subglabrous.

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[1] This is the third of a series of articles on North American Nomadidae. For the previous parts see Trans. Amer. Ent. Soc., LXV, pp. 265-305, and 347-362, 1939.

Key to the Species of Oreopasites

Females

1. Mesoscutum sparsely and irregularly punctured, surface highly polished, subglabrous, discal punctures on each side of median impression averaging two or more puncture widths apart; fifth abdominal sternite without an elevated, V-shaped, pubescent, subapical collar; wings hyaline 2

   Mesoscutum closely and more regularly punctured, surface dull or moderately shining, usually pubescent, discal punctures on each side of median impression averaging less than one puncture width apart; fifth abdominal sternite with an elevated, V-shaped, pubescent, subapical collar; wings infuscated 4

2. Propodeum with only the disk glabrous, sides and anterior angles densely clothed with prostrate, white, plumose hairs which obscure the surface; legs and abdomen ferrugineous, anterior femora sometimes darkened above 3

   Propodeum with entire dorsal surface subglabrous, sides and anterior angles without dense patches of white hairs; legs and apical abdominal tergites wholly or dominantly dark brown or black. 5–5.5 mm. (Colorado) ....*scituli*

3. Abdominal sternites clothed with long, white, prostrate hairs, broad apical impression of third sternite finely, distinctly punctate, fifth sternite finely punctured at base, apex with a median keel-like ridge, apical process of sixth sternite shallowly notched. 6 mm. (Arizona). *arizonica*

   Abdominal sternites without long, white, prostrate hairs, broad apical impression of third sternite impunctate, fifth sternite coarsely punctured at base, apex without a median keel-like ridge, apical process of sixth sternite deeply notched. 4 mm. (Southern California) ....*euphorbiae*

4. Mesoscutum with disk obscured by a dense vestiture of prostrate, white, heavily plumose hairs. 6 mm. (Southern California) ....*albinota*

   Mesoscutum with disk subglabrous or thinly clothed with fine, grayish or yellowish hairs ....*vanduzeei*

Males

1. Disk of mesoscutum finely, sparsely irregularly punctured, punctures on each side of median line one to several puncture width apart; wings hyaline or subhyaline 2
   Disk of mesoscutum closely more regularly punctured, punctures on each side of median line mostly less than one puncture width apart; wings tinted with fuscous ....*vanduzeei*
2. Abdomen and legs wholly or dominantly black or dark brown; dorsal surface of propodeum glabrous. 5 mm. (Colorado) ....*scituli*
   Abdomen and legs (at least intermediate and posterior pairs) wholly or dominantly ferrugineous; dorsal surface of propodeum with sides and anterior angles densely pubescent. 3.5-4 mm. (Southern California). *euphorbiae*

Oreopasites scituli Cockerell

1906. *Oreopasites scituli* Cockerell, Bull. Am. Mus. Nat. Hist., XXII, p. 442. ♂, ♀.

Distinguished from the other known species by the glabrous propodeum, finely, sparsely punctured mesoscutum, and the very feebly notched apical process of the sixth abdominal sternite of the female.

Females.—Color of head, thorax, and legs black, tegulae pale reddish, abdomen red, apical tergites darkened.

Head narrower than thorax; antennae moderately short, attaining tegulae, flagellum brownish beneath; vertex and interantennal area finely punctured, pubescence fine, sparse, yellowish; lower face clothed with prostrate, white, plumose hairs; cheeks irregularly punctured, sparsely pubescent; clypeus subglabrous, closely but irregularly punctured; labrum black; mandibles reddish.

Thorax with mesoscutum shining, highly polished, disk glabrous, finely, sparsely, irregularly punctured, punctures on each side of median depression varying from one to several puncture widths apart; mesoscutellum sparsely but more coarsely punctured than mesoscutum, sparsely pubescent; metanotum densely clothed with prostrate, white, plumose hairs; mesepisterna and mesosternum thinly clothed with plumose, white hairs, surface moderately finely punctured; wings hyaline, veins pale brownish; legs black.

Propodeum subglabrous, shining, without a dense patch of plumose white hair at sides and along anterior margin.

Abdomen red, tergites three to six wholly or clouded with black; white hair-bands on tergites two to five moderately dense; sternites one to four thinly clothed with fine pubescence but without dense white hair-bands, fifth sternite without an elevated, V-shaped, densely pubescent, subapical collar, surface finely punctured, thinly clothed with long, suberect hairs except for a median, polished, apical, keel-like process; sixth sternite with apical process very shallowly notched at tip.

Length: 5 to 5.5 mm.

Male.—Form more slender; abdomen black with first tergite obscurely reddish and sternites brownish.

Length, 5 mm.

Type locality.—Lake George, Colorado.

Additional localities.—Salida, Colorado (Chas. Wagner, in T.D.A. Cockerell collection).

Flight period.—June 20 (Wagner) to July 5 (Cockerell).

Host.—*Nomadopsis scitula* (Cresson) (Cockerell, 1906).

The above description of the female is based on a specimen from Salida, Colorado, very kindly loaned by Dr. Cockerell. This example, and the male and female types, are the only representatives of this species known to the writer.

Oreopasites arizonica new species

Related to *scituli* with which it agrees rather closely in the form of the fifth and sixth abdominal sternites of the female. It may be separated at once, however, by the coarsely punctate mesoscutum, the densely pubescent propodeum with only the disk glabrous, the long, white prostrate, plumose hair-bands of the abdominal sternites, and the color of the antennae, legs, mouth parts, tegulae, and abdomen.

Female.—Color of head and thorax black, abdomen red; anterior and middle femora and tibiae piceous to very dark reddish, tarsi and posterior legs more or less ferrugineous.

Head narrower than thorax; antennae moderately short, barely attaining tegulae, dark brownish, first two flagellar segments reddish, the first but a little longer than the second; face (except apical two-thirds of clypeus) and cheeks densely clothed with prostrate, heavily plumose, silvery white hair; clypeus black, moderately coarsely, irregularly, and subrugosely punctured; labrum black, very irregularly punctured, tessellate; mandibles piceous, rufo-piceous at middle.

Thorax with mesoscutum polished, glabrous except at sides, irregularly, coarsely punctured, the punctures closely placed in median depression, varying from one to several puncture widths apart at sides of disk; mesoscutellum almost evenly convex, surface coarsely, irregularly punctured, thinly clothed with fine, yellowish white hairs; metanotum densely clothed with silvery, recumbent, heavily plumose pubescence which completely obscures the surface; mesepisterna densely pubescent, the surface, where exposed, moderately coarsely rugoso-punctate; mesosternum coarsely, irregularly punctured, with only a few scattered hairs; tegulae piceous; wings hyaline; legs piceous to reddish, posterior pair palest, femora clothed with scattered suberect hairs, tibiae with dense white pubescence.

Propodeum dull, tessellate, disk glabrous, sides and anterior angles finely, closely punctate, densely clothed with heavily plumose, prostrate, white hairs.

Abdomen with a dense patch of white pubescence at sides of tergites one to five, the fasciae becoming successively more transverse, those of fifth tergite nearly meeting on disk, sixth tergite densely-pubescent; basal elevations of tergites narrow, that of third segment distinctly less than apical depression; second tergite finely but distinctly punctured on basal elevation, the punctures nearly contiguous, apical depression sparsely, finely punctured, the punctures less distinct and separated by several puncture widths; sternites clothed with long, white, plumose hairs, apices of segments without a fringe of hairs, surface finely, closely, distinctly punctured on basal elevation, apical depression of second sternite sparsely, finely punctured, that of third finely but distinctly punctured, that of fourth polished, glabrous, extremely minutely punctured; fifth sternite without a distinct, V-shaped, subapical collar, apex entire, finely punctured and pubescent, with a median, polished, keel-like process; apical process of sixth sternite shallowly notched.

Length, 6 mm.

Holotype.—Female; captured near Buckeye, Arizona; March 29, 1934; (Mr. P. H. Timberlake; at flowers of *Heliotropium*) [Timberlake collection].[2]

Oreopasites euphorbiae Cockerell (Text-figure 1.)

1929. *Oreopasites euphorbiae* Cockerell, Pan-Pac. Ent., v, p. 105. ♀, ♂.

Easily recognized by the small size (approx. 4 mm.), sparsely and irregularly punctured mesoscutum, feebly differentiated fifth abdominal sternite of the female, and narrow genital capsule of the male with the coxopodites together longer than broad.

Female.—Color of head and thorax piceous or dark reddish, antennae, mouth parts, tegulae, legs, and abdomen red.

Head narrower than thorax; antennae moderately short, barely attaining tegulae, flagellum brownish above, ultimate segment flattened; face and cheeks densely clothed with depressed, heavily plumose, white hairs; clypeus closely punctured, clothed with depressed, plumose, white hairs; mandibles frequently with apices piceous.

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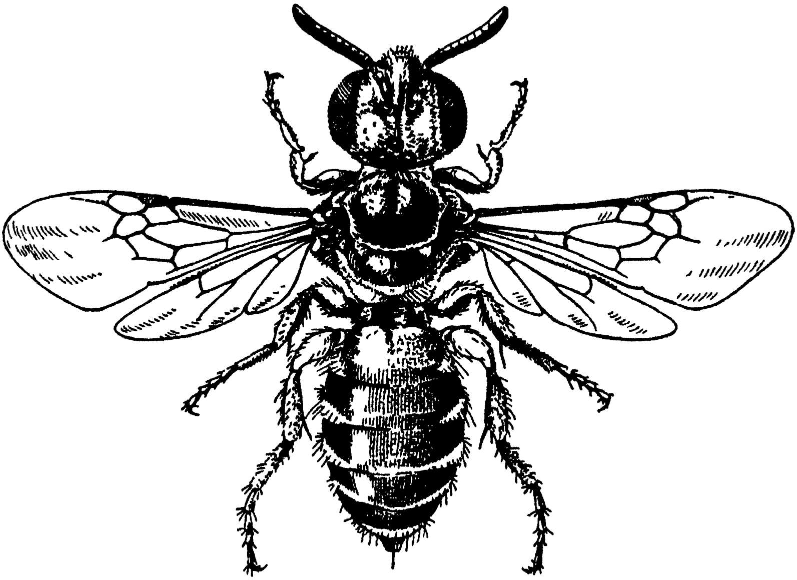
[2] The writer is indebted to Mr. Timberlake for the privilege of studying the species.

Thorax with mesoscutum polished, shining, disk glabrous, sparsely, irregularly punctured, discal punctures varying from one to several puncture widths apart; mesoscutellum biconvex, more closely punctured than mesoscutum, anterior margin and disk subglabrous, remaining surface clothed with coarse, depressed, plumose, white hairs; metanotum densely clothed with plumose white hairs which obscure the surface; mesepisterna finely, not closely punctured, densely clothed with depressed, plumose, white hairs; mesosternum more coarsely punctured and less densely pubescent than mesepisterna; wings hyaline, veins pale brownish; legs reddish, posterior pair palest.

Propodeum shining, disk glabrous, impunctate, sides and anterior margin densely clothed with prostrate, white, plumose hair.

Abdomen pale reddish, segments finely punctate, sparsely pubescent, tergites two to four broadly interrupted at middle, fifth entire; basal elevations of tergites broad, that of third tergite at least as wide as apical depression; sternites glabrous, apical depression of third sternite impunctate, fifth sternite without a distinct, V-shaped, subapical collar, apex thinly sclerotized, shining, subglabrous, nearly impunctate, bilobed; apical process of sixth sternite deeply notched.



TEXT-FIGURE 1—*Oreopasites euphorbiae* Cockerell, ♀. (× 15)

Male.—Color of legs piceous, apical abdominal tergites sometimes darkened; genital capsule small, slender, feebly pigmented, coxopodites together longer than broad, stipites and sagittae sparsely setose, sagittae nearly as long as stipites, apices suddenly widened, spatulate, much broader than apices of stipites, sagittal apodemes very slender, nearly as long as sagittae; spatha three-fourths as long as stipites.

Length, 3.5 to 4 mm.

Type locality.—Riverside, California.

Flight period.—August and early September.

Host.—*Nomadopsis euphorbiae* (Cockerell).

Thirty-five specimens of *Oreopasites euphorbiae* have been seen, mostly collected on *Euphorbia albomarginata* at the type locality by P. H. Timberlake. It is typically an autumnal species although Mr. Timberlake once captured a specimen as early as June 25.

Oreopasites albinota new species

Distinguished from the other known species by having the mesoscutum densely clothed with moderately long, coarse, silvery white, prostrate heavily plumose hairs. Related to *vanduzeei* but further distinguished by the piceous labrum, and tegulae, dark ferrugineous abdomen and legs, and the dense apical fringe of the abdominal sternites.

Female.—Color of head and thorax black, tegulae and labrum piceous, legs and abdomen dark ferrugineous.

Head narrower than thorax; antennae short, not attaining tegulae, brown, ferrugineous beneath, first segment of flagellum shorter than following two together; vertex and interantennal area clothed with long, erect, white hairs, upper and lower face clothed with coarse depressed, silvery white hairs; cheeks densely punctured and pubescent; clypeus moderately coarsely, closely, subrugosely punctured, lateral apical angles prominent; mandibles ferrugineous, apices darker.

Thorax with mesoscutum moderately shining, densely clothed with coarse, prostrate, white hairs which obscure the surface; integument moderately finely, closely punctured, the discal punctures on each side of median line mostly less than one puncture width apart; scutellum clothed similarly to mesoscutum but less closely punctured; metanotum more densely covered with white hair than mesoscutum or scutellum; tegulae piceous; mesopisterna and mesosternum densely clothed with long, white hairs; wings nearly clear, veins pale brownish, second submarginal cell receiving first recurrent nervure just before middle, second recurrent nervure just before apex; legs dark ferrugineous, anterior and intemediate femora clouded with brownish above.

Propodeum dullish, disk glabrous, sides and anterior angles finely, closely punctate, densely clothed with prostrate white hair, basal triangle finely, closely punctured.

Abdomen dark ferrugineous, shining, moderately pubescent, basal cavity of first tergite clothed with depressed white hairs, tergites one to five with a distinct band of pale hairs along posterior margins, those of tergites one to four broadly interrupted at middle; fifth tergite truncate at apex; sternites polished, shining, finely and indistinctly punctured at base, apical depressions impunctate, posterior margins of segments with a dense fringe of long white hairs; fifth sternite with an elevated, V-shaped, densely pubescent, subapical collar.

Length, 5.5 mm.

Holotype.—Female; Yermo, San Bernardino County, California; April 28, 1937; (collected by M. A. Cazier); [California Academy of Sciences, no. 4962].

Oreopasites vanduzeei Cockerell

1925. *Oreopasites vanduzeei* Cockerell, Proc. Calif. Acad. Sci., (4), XIV, p. 202. ♀.

Distinguished from the preceding species by having the disk of mesoscutum glabrous or thinly clothed with fine, pale, cream-colored pubescence.

Female.—Color of head and thorax black, abdomen more or less ferrugineous.

Head narrower than thorax; antennae attaining tegulae, tinted with brownish above, first segment of flagellum nearly as long as following two together; upper face clothed with fine, erect or suberect, obscurely yellowish pubescence, lower face covered with coarse, prostrate, silvery-white, scale-like hairs; clypeus shining, finely punctured; labrum pale ferrugineous, base clothed with long, coarse, erect pale hairs; mandibles with apices piceous.

Thorax with mesoscutum glabrous or thinly clothed with fine, pale, cream-colored pubescence except along lateral and posterior margins where the pubescence is replaced by coarse, prostrate, silvery-white, scale-like hairs; integument moderately finely, closely punctured, the discal punctures on each side of median line mostly less than one puncture width apart; scutellum and metanotum densely clothed with coarse, depressed, silvery-white, scale-like hairs which obscure the surface; tegulae ferrugineous; mesepisterna and mesosternum moderately densely but irregularly .clothed with coarse, appressed, silvery-white hairs which do not obscure the surface, punctures moderately fine, close; wings tinted with fuscous, veins ferrugineous, second submarginal cell receiving first recurrent nervure just before middle, second recurrent nervure just before apex; legs ferrugineous, anterior femora clouded with brownish above.

Propodeum dull, disk and basal triangle glabrous, sides and anterior angles clothed with coarse, appressed, white hairs.

Abdomen ferrugineous, moderately shining, sparsely pubescent, basal cavity of first tergite glabrous, tergites two to five with thin bands of pale hairs along posterior margins those of tergites two to four broadly interrupted at middle; fifth tergite pointed and roof-shaped; sternites polished, finely punctured and sparsely pubescent, without a fringe of dense white hairs, apical depressions impunctate, third sternite with basal elevation finely closely punctured, fifth sternite with an elevated, V-shaped, pubescent, subapical collar.

Male.—Color of head and thorax black, abdomen wholly or partly ferrugineous; genital capsule moderately large, broad, coxopodites together broader than long, stipites moderately clothed with setae, longer and more numerous apically, sagittae distinctly shorter than stipites, basal two thirds densely covered with setae, apices thickened but not spatulate, sagittal apodemes shorter than sagittae, spatha less than one-half as long as stipites.

Oreopasites vanduzeei apparently breaks up into a number of subspecies as follows:

Oreopasites vanduzeei vanduzeei Cockerell

Distinguished from the other known subspecies by the smaller size and the dull mesoscutum which is thinly and more or less uniformly clothed with fine, pale pubescence as well as its host and flight period (autumn).

Female.—Color of head and thorax black, antennae, mouth parts, legs, and abdomen pale ferrugineous; mesoscutum dull, rather uniformly and thinly clothed with fine, pale pubescence, punctures mostly less than one puncture width apart; wings lightly infuscated. Length 4.5–5 mm.

Male.—Color of abdomen pale ferrugineous; genital capsule feebly pigmented. Length 4.5–5 mm.

Type locality.—Stockton, California.

Other localities.—Oakley, California; (G. E. Bohart, C. D. Michener, and E. G. Linsley).

Flight period.—August 21 to November 19.

Host.—*Nomadopsis equina* (Cockerell).

Oreopasites vanduzeei diabloensis new subspecies

Similar in size and form to typical *vanduzeei* but with the mesoscutum subglabrous and more shining, the abdomen dark ferrugineous, and the antennae and legs partly piceous. It is also a vernal subspecies with a different host bee.

Female.—Color of head and thorax black, antennae and legs partially piceous; mesoscutum shining disk subglabrous, punctures mostly less than one puncture width apart; mesoscutellum subglabrous or very sparsely pubescent; wings moderately infuscated. Length 4.5–5 mm.

Male.—Color of abdomen ferrugineous, apical tergites sometimes clouded with piceous; genital capsule lightly pigmented. Length 4.5–5 mm.

Holotype.—Male; Mt. Diablo, Contra Costa Co., California; May 7, 1939; (G. E. Bohart and J. W. MacSwain; from nests of *Nomadopsis* sp. (near *anthidia*); [Academy of Natural Sciences of Philadelphia, no. 8220].

Allotype.—Female with same data; [Acad. Nat. Sci. Phila.].

Paratypes.—1 ♂, 10 ♀; with same data.

Paratypes have been deposited in the collections of the California Academy of Sciences, G. E. Bohart, J. W. MacSwain and the author.

Oreopasites vanduzeei melanantha new subspecies

Similar in size and form to the subspecies *vernalis* but differing by having darker wings, thinner pubescence on the mesoscutellum, metanotum, and mesepisterna, a dark abdomen in the male, and heavily pigmented male genitalia with the sagittal apodemes broadened at the middle. Superficially this subspecies bears a strong resemblance to *scituli* but may be distinguished at once by the dark wings, closely punctured mesoscutum, pubescent propodeum, and the form of the fifth abdominal sternite of the female.

Female.—Color of head, thorax, legs, antennae, and labrum black or piceous, abdomen dark red, apical tergites frequently darkened; punctures of mesoscutum mostly less than one puncture width apart; pubescence of mesoscutellum, metanotum, and mesepisterna thin, not obscuring surface; wings infuscated. Length: 5–6.5 mm.

Male.—Color of abdomen black, sternites and apical margins of tergites frequently brownish; genital capsule heavily pigmented, sagittal apodemes moderately stout, broadened at middle around an oval, thin, feebly pigmented spot, spatha a little more than one-half as long as stipites. Length, 5 to 6 mm.

Holotype.—Female; Madera County, California, 3000 feet altitude; May 17, 1938; (R. M. Bohart; about the nests of *Nomadopsis anthidia* (Fowler)); [Academy of Natural Sciences of Philadelphia, no. 8221].

Allotype.—Male with same data; [Acad. Nat. Sci. Phila.].

Paratypes.—1 ♂, 8 ♀; same data. 1 ♂, 2 ♀; El Portal, Tuolumne Co., California; May 18-27, 1938; (R. M. Bohart). 1 ♂, 1 ♀; Tuolumne County, California; June 9, 1938.

Paratypes have been placed in the collections of the Academy of Natural Sciences of Philadelphia, the California Academy of Sciences, Dr. R. M. Bohart, Dr. T. D. A. Cockerell, Mr. P. H. Timberlake and the author.

Oreopasites vanduzeei vernalis new subspecies

Related to *melanantha* and agreeing with that subspecies in the form of the fifth and sixth abdominal sternites of the female. It differs, however, in the paler wings and dense white pubescence of the mesoscutellum, metanotum, and mesosternum in both sexes, and the red abdomen and pale genital capsule of the male.

Female.—Color of head and thirax black, legs reddish to rufo-piceous; abdomen ferrugineous; puncture of mesoscutum mostly less than one puncture width apart; pubescence of mesoscutellum, metanotum, and mesepisterna dense obscuring surface; wings moderately infuscated. Length 5.5–6 mm.

Male.—Color of flagellum, labrum, and mandibles black, legs black or piceous; genital capsule feebly pigmented, sagittal apodemes moderately stout but not distinctly broadened at middle, thin spot slender, elongate. Length, 5–6 mm.

Holotype.—Female; Deep Creek, Mojave Desert, San Bernardino County, California; May 8, 1937; (E. G. Linsley; about the nests of *Nomadopsis* sp. (near *anthidia*)); [Academy of Natural Sciences of Philadelphia, no. 8222].

Allotype.—Male; same data; [Acad. Nat. Sci. Phila.].

Paratypes. 3 ♂, 9 ♀; same locality; May 16, 1937; (by E. G. Linsley and by P. H. Timberlake). 3 ♂, 3 ♀; Lone Pine, Inyo Co., California; June 6, 7, 1937; (C. D. Michener). 1 ♂, 1 ♀; Riverside, California; April 12, May 8; (P. H. Timberlake). 1 ♀; Gavilan, Riverside Co., California; May 19, April 12; (P. H. Timberlake).

Paratypes have been deposited in the collections of the California Academy of Sciences, P. H. Timberlake, T. D. A. Cockerell, C. D. Michener and the author.

Oreopasites vanduzeei xerophila new subspecies

Similar in size and form to typical *vanduzeei* but more shining and with the mesoscutum and mesoscutellum less closely and regularly punctured.

Female.—Color of head and thorax black, legs and abdomen pale ferrugineous; mesoscutum shining, punctures mostly more than one puncture width apart; pubescence of mesoscutellum, metanotum, and mesepisterna dense, obscuring surface. Length, 4.5 to 5 mm.

Male.—Color of abdomen pale ferrugineous; genital capsule feebly pigmented. Length, 4.5 to 5 mm.

Holotype.—Female; Andreas Canyon, near Palm Springs, Riverside County, California; April 10, 1932; (about the nests of *Nomadopsis* sp.); [P. H. Timberlake Collection].

Allotype.—Male; with same data; [P. H. Timberlake]

Paratypes.—3 ♂, 4 ♀; same data. 2 ♂, 3 ♀; same locality; April 7, 1940; (R. M. Rohart; in association with an undescribed species of *Perdita*).

Paratypes have been placed in the collections of the Academy of Natural Sciences of Philadelphia, P. H. Timberlake and the author.

STUDIES IN THE MELYRIDAE NO. 12[1]

(COLEOPTERA)

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The present opportunity is taken to make known three new and interesting species in the family Melyridae. Many undiscribed species are at hand and it is desirable to make known, the more important of these as rapidly as may be convenient, namely:

Eudasytes brunnipilosa new species

Brunnipilosa is distinct by its entirely dark color and brownish, ashy pubescence of the upper surface of the body and, absence of all erect hairs or setae. *Ursinus* Casey and *hirsutus* Blaisdell have black legs. In *ursinus* erect long black setae are especially abundant on the elytra. In *hirsutus* the sides of the pronotum are parallel, apical angles not deflexed, the basal rectangular and slightly prominent laterally; the species occurs abundantly in the vicinity of Tonopah, Nevada.

Form oblong, parallel, somewhat depressed and about two and one-half times as long as wide. Color black, appendages and mouth-parts piceous to piceo-ferruginous. Pubescence recumbent, not dense, most sparse on the pronotum, without erect hairs or setae; color brownish to slightly ashy, darker on the head and pronotum, that of the ventral surface cinereous and somewhat ferrugineous on the legs. Lateral fimbria of the pronotum and elytra short, recurved, inconspicuous and dark in color.

Head relatively small, twice as wide as long before the post-ocular line, articulating membrane and labrum not included; sides not prominent laterally nor convex over the antennal insertions, the later somewhat exposed, margins noticeably thickened as well as the epistomal region. Frons less than moderately convex, feebly impressed each side of a slight median tumescence, the latter briefly basad to the connate epistomal base; vertex more strongly and broadly convex; surface somewhat shining, finely and sparsely punctate, punctures dense on the vertex. Eyes moderate in size and prominence, facets small, numerous and not setose. Antennae moderately robust, in length equal to the width of the head and, about attaining the basal third of the pronotum, differing in the sexes.

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[1] For Studies No. 11, see Pan-Pacific Entom., XII, p. 184, 1936.

Pronotum somewhat different in the sexes, about one-third wider than long; apex arcuate between the prominent apical angles, noticeably sinuate within the latter which are moderately large and rounded at tip; sides arcuate, basal angles distinct and obtusangular; base broadly and moderately arcuate, one-fifth wider than apex, the latter equal to the pronotal length. Disk moderately convex, antero-laterally declivous with the angles; lateral margins very narrowly reflexed, surface rather densely punctate, punctures very small and separated by a distance equal to two to four times their diameters, scarcely denser laterally.

Elytra oblong, about one-half longer than wide; base broadly emarginate, humeri not prominent nor tumid; sides parallel to apical third, thence arcuately convergent to the apices, each separately rounded and dehiscent at the suture. Disk moderately convex from side to side, arcuately declivous laterally, abruptly so at the humeri, thence feebly impressed to about the middle, very gradually and arcuately declivous in apical third; lateral margins narrowly explanate, horizontal and slightly concave, edges finely denticulate, visible throughout the length from above except at the humeri; surface densely and finely punctate. Epipleurae broad and horizontal to very near the apex, inner margins distinct throughout and not inflexed. Scutellum subquadrate and moderately small.

Abdomen densely punctate, punctures fine. Legs moderate in length.

Male. Usually somewhat narrower, pronotum a little wider and rather more convex than in the female. Antennae a little more robust, second segment suboval, as long as wide, third obconical, elongate, one-half longer than wide, slightly more convex and swollen apically; fourth segment subtriangular, smaller than the following and as long as wide; five to ten inclusive subserrate and prominent anteriorly, subequal in length, seventh slightly largest, eleventh obovate and truncate at apex, a little longer than wide. Fifth abdominal segment transverse and sinuate at apex.

Female. Usually a little larger and broader. Prothorax not as wide with sides rather feebly arcuate and more parallel in basal two-thirds, thence more strongly arcuate and convergent to apex. Antennae less robust, segments less prominent anteriorly, third obconical, more slender, longitudinal surface lines straight, twice as long as wide at apex. Fifth abdominal segment a little longer than the fourth and not strongly arcuate at apex.

Measurements: (Types) Length, 4 to 4 mm.; width, 1.4 to 2.0 mm.

Holotype.—Male; Mint Canyon, six miles west of Palmdale, California; April 20, 1932; (E. P. Vanduzee). [Collection of The California Academy of Sciences, no. 4957.]

Allotype.—Female; with same data. [Colln. Cal. Acad. Sci., no. 4958.]

Paratypes.—2 ♂; with same data. [Colln. Cal. Acad. Sci.; Amer. Ent. Soc.]

Eutrichopleurus concinnus new species

Concinnus has to be differentiated from the following congeneric species: *Seriellus* Casey and *zionicus* Tanner. In *seriellus* and pubescence is cinereous, moderately long and coarse, dense and intermingled with erect pale setae on the elytra; legs black, tibiae and tarsi rufescent. A specimen identified by Col. Casey is at hand, who mentions that some specimens have the legs and antennae rufous throughout, an occasional specimen may have the antennae blackish apically. The latter may be *zionicus* Tanner.

In *concinnus* the pubescence is short, dense, not coarse and closely appressed to the surface, pale ochraceous in color; the elytral marginal bead is narrowly explanate and visible from above; erect hairs are absent from the pronotum, on the elytra they are present, especially laterally, semi-erect and subserial.

Form oblong-oval, three times as long as wide. Color black, four basal antennal segments and legs ferruginous, distal antennal segments more or less piceo-ferruginous. Pubescence dense and appressed, obscuring the elytral surface; hairs moderately short, slender, slightly coarser on the elytra than on the pronotal disk and with a feeble brownish yellow tinge (ochraceous). Pronotum without erect hairs or setae, elytra with sparse semi-erect yellowish setae, which are usually more conspicuous laterally than in the sutural region, best seen when viewed obliquely to the surface. Lateral pronotal fimbria regular, close set and moderate in length, those of the apical margin shorter and rather closely decurved; of the elytral margins moderately long, straight and obliquely directed outward and backward, becoming gradually shorter toward apex. Pubescence of the ventral surface moderately dense, fine, appressed and plumbeous in color on the sterna; cinereous on the parapleurae and abdomen; sparser and darker on the prosternum, on the legs pale ferruginous.

Head about one-fifth wider than long before the post-ocular line. Frons slightly convex, slightly longitudinally impressed each side of a feeble median tumescence behind the connate epistoma; surface finely and sparsely punctate; sides not prominent over the antennal insertions. Vertex more strongly and broadly convex. Eyes rather large, moderately prominent, facets small, numerous and not noticeably setose. Antennae moderately long, attaining the basal fourth of the pronotum and differing more or less in the sexes.

Pronotum transverse, one-third wider than long, apex transverse in moderate circular arc, angles well rounded and not in the least prominent; sides broadly arcuate, basal angles feebly obtuse or obsolete; base broadly arcuate, somewhat broadly and feebly sinuate laterally; disk convex, very feebly impressed at base at the sinuations, evenly and finely punctate, punctures separated by a distance equal to one or two times their diameters.

Elytra oblong, two-thirds longer than wide, base broadly emarginate, humeri rounded and not prominent nor tumid; sides parallel, apex subparabolically rounded. Disk feebly convex and somewhat plane, moderately arcuately declivous laterally, the declivity feebly impressed from the humeri to the middle of the side, gradually declivous in apical fourth; surface densely punctate, punctures small and usually obscured by the pubescence. Lateral margins slightly reflexed, invisible at the humeri when viewed from above, submarginal grooves very narrow. Epipleurae narrow, widest at base and thence gradually narrowing but not attaining the apex, surface horizontal, inner margin distinct throughout. Scutellum subquadrate and moderately small.

Abdomen finely and densely punctate. Legs moderate in length, meta-femora and meta-tibiae quite equal in length and, one-fifth of their length longer than the meta-tarsi.

Male. Pronotum usually slightly larger and heavier, a little wider than the elytra; sides moderately strongly arcuate, often less so anteriorly and slightly convergent in apical three-fourths and somewhat widest at basal fourth, thence feebly sinuate to the obtuse basal angles, or continuously arcuate with the basal margin. Antennae more robust, second segment suboval, narrowed slightly at base; third slightly longer than wide, somewhat swollen anteriorly, fourth stouter, about as long as wide, feebly tumid anteriorly, surface lines arcuate; segments five to ten inclusive transverse and moderately prominent anteriorly, fifth larger than the following segments except the tenth and arcuately swollen anteriorly; tenth larger and wider, prominent anteriorly, eleventh obovate, almost as long as wide.

Female. Pronotum less heavy and about as wide as the elytra; sides broadly and moderately strongly arcuate, feebly convergent anteriorly. Antennae less robust, second segment obconical and one-half longer than wide at apex; third obconical, somewhat slender and twice as long as wide at apex, sides straight; segments four to nine inclusive similar and smaller than in the male, fourth smallest. Fifth abdominal segment longer and arcuate at apex. Legs rather less stout.

Measurements: (Types) Length, 3 to 3 mm.; width, 1.5 to 1.4 mm.

Holotype.—Male; St. George, Utah; May 28, 1935; (Edwin C. Van Dyke. [Van Dyke Collection, California Academy Sciences, no. 4955.]

Allotype.—Female; with same data. [Colln. Van Dyke, Cal. Acad. Sci., no. 4956.]

Paratypes.—41 specimens; with same data. [Colln. Van Dyke, Cal. Acad. Sci., 31; Amer. Ent. Soc., 10.]

Trichochrous panamintensis new species

A rather large species easily recognized by the coarse punctation. The discal impression within the obtuse basal angles of the pronotum are for the most part obsolescent.

Form oblong-oval, about two and two-thirds times as long as wide. Color black, antennal segments two to eight inclusive more or less rufous basally, first and last three nigro-fuscous; tibiae rufo-piceous, tarsi rufous. Pubescence not dense, cinereous with a slight flavous tinge, moderately short, slender, of uniform length and recumbent; erect setae entirely absent; of the ventral surface shorter, finer, appressed, that of the sterna and parasterna sparser, moderately dense on abdomen. Lateral pronotal fimbria moderately short, upwardly and backwardly curved; of the elytra slightly longer, quite straight, directed outward and backward, gradually diminishing in length from base to apex.

Head moderately large, about less than one-third wider than long before the post-ocular line; sides convergent, not prominent nor convex over the antennal insertions, the latter more or less exposed. Front moderately convex, very feebly and broadly impressed within the sides, densely indentato-punctate. Epistoma connate and not defined, apex truncate, beading slightly pale at margin, articulating membrane more or less pale and smooth. Eyes large, moderately prominent, not setose. Antennae extending slightly beyond the pronotal base, somewhat stout and differing in the sexes.

Pronotum moderately transverse, about one-half wider than long; apex emarginato-truncate, angles rather broadly rounded; sides rather strongly arcuate, noticeably sinuate in basal fourth, lateral margins feebly beaded and minuately crenulate; base broadly arcuate, slightly and broadly sinuate laterally, angles distinct and obtusangulate. Disk moderately convex from side to side, feebly but distinctly impressed within the basal angles; discretely and rather strongly punctate, punctures somewhat coarse, separated by a distance equal to two or three times their diameter, becoming slightly denser in lateral fourths, intervals feebly and finely rugulose, otherwise the surface is smooth and polished.

Elytra oblong, one-third longer than wide, about three times as long as the pronotum; base slightly emarginate, a little wider than the pronotal base, scutellum small, humeral angles obtusely rounded; sides slightly arcuate and parallel to about apical third, thence gradually converging and broadly arcuate at apex, sutural angles rather narrowly rounded; lateral margins slightly explanate, most so behind the humeri, visible from above. Disk moderately convex, gradually declivous in about lateral thirds, rather densely punctate, intervening surface feebly undulating.

Abdomen moderately convex and densely punctate. Legs moderate in length and stoutness.

Male. Narrower. Pronotum wider, quite as wide as the elytra. Pronotal base slightly wider than the apex. Antennae distinctly stouter; segments three to six inclusive quite as long as wide, subtriangular, third slightly swollen anteriorly and apically; distal segments wider than long, seventh slightly widest and subtriangular; eleventh obovate and as long as wide. Fifth ventral abdominal segment truncate at apex.

Female. Broader. Head and pronotum somewhat smaller, elytra slightly wider. Pronotal base and apex subequal in width. Antennae less stout, segments two and three elongate-obconical, third twice as long as wide, second stouter and slightly swollen anteriorly in apical two-thirds, narrowed at base, about a fourth longer than wide; four and five subtriangular, the latter larger and more prominent anteriorly, distal segments about as long as wide, constricted at base and not noticeably transverse; eleventh obovate, nearly twice as long as wide. Fifth ventral abdominal segment arcuate at apex.

Measurements: (Types) Length, 5 to 5.1 mm.; width, 1.9 to 2 mm.

Holotype.—Male; Panamint Mts., Inyo County, California; May 24, 1937; (E. C. Van Dyke). [Van Dyke Collection, California Academy Sciences, no. 4959.]

Allotype.—Female; with same data. [Colln. Van Dyke, Cal. Acad. Sci., no. 4960.]

Paratypes.—48 specimens; with same data. [Colln. Van Dyke, Cal. Acad. Sci., 30; Amer. Ent. Soc., 10; author's, Cal. Acad. Sci., 8.]

INDEX

New names are followed by the name of the author within parentheses ( ). An asterisk * denotes that a figure is referred to on that page. Italics refer to names in synonymy.

aciculatus, Belomicrus 248
aciculeatus, Trox (Robinson) . 156*
acrisione, Athesis 177*
aculeatus, Aphodius (Robinson) 143
adelphina, Ithomia 193
aedesia, Xanthocleis, *Thyridia* . 181
aegle, Aeria 185*
aequalis, Trox 159*
Aeria 185*
affinis, Argyresthia (Braun) ... 276*
affinis, Trox (Robinson) 158*
agnosia, Ithomia 186*
agrippina, Ithomia 195
albilineata, Scythris, *Butalis* ... 280
albinota, Oreopasites (Linsley) . 313
aletta, Ithomia 197
alixirrhoë, Callithomia 194
Anastrus (*see* lacydus, niger)
andromica, Greta 204*
antennalis, Belomicrus 230
antisao, Pteronymia 197
apache, Belomicrus (Pate) . 15*, 214
Aphodius (*see* aculeatus, comanchi, convexus, excavatus, inermis, magnificens, pennsylvanicus, saylorea, serval, transversus)
Apis (*see* nigra)
approximatus, Celaenorrhinus (Williams & Bell) 126*
Aprotopos 181
Argyresthia (*see* affinis, ruidosa, thuiella)
arizonica, Oreopasites (Linsley) 310
arizonica, Zelleria (Braun) ... 279*
aster, Napeogenes 192*
astra, Philosora (Williams & Bell) 138*
astraea, Oleria, *Papilio* 193
Athesis 177
Athyrtis 180*
augustella, Choreutis 273
Aulacobothrus (*see* strictus)
aurocapilla, Pholisora, *Helias*, *Staphylus* 128*
australe, Enchemicrum 259*

barilla, Pteronymia 198*
Belomicroides 6
(*See also* marleyi, maurusius, pictus, santschii, schmiedeknechtii)
Belomicroidinae *6*
Belomicrus 6, 9, 11, 209
Key to species 210
(*See also* aciculatus, antennalis, apache, bicornutus, borealis, braunsii, bridwelli, caesariensis, cahuilla, cladothricis, coloratus, columbianus, cooki, crassus, cucamonga, eriogoni, excisus, fasciatus, femoralis, ferrieri, forbesii, franciscus, funestus, istam, italicus, jurumpa, kolianus, kohlii, larimerensis, mescalero, meyeri, minidoka, minutissimus, mirificus, modestus, mono, moricei, obscurus, pachappa, parvulus, penuti, persa, prosopidis, quemaya, querecho, radiatus, rhodesianus, rufiventris,

schulthesii, sechi, serrano, sordidus, steckii, timberlakei, tuktum, turneri, vanyume, vierecki, waterstonii)

bicornutus, Belomicrus, Nototis 243

bonplandi, Elzunia 176

borealis, Belomicrus, Oxybeloides 243

Borellia 113

braunsii, Belomicrus, Oxybelomorpha 223, 242

bridwelli, Belomicrus (Pate) 93*, 212

Brimocelus 9
(*See also* radiatus)

brunneri, Rhammatocerus, *Pseudostauronotus* 114*

brunipilosa, Eudasytes (Blaisdell) 319

buena, Philosora (Williams & Bell) 131*

Butalis (*see* albilineata)

caesariensis, Belomicrus, Oxybelomorpha 232

cahuilla, Belomicrus (Pate) 39*, 210

californiae, Glyphipteryx 274

callipero, Dircenna 195

Callithomia 194*

Calloleria 192

camariensis, Sais 183*

caribbea, Pholisora (Williams & Bell) 129*

carinata, Borellia 113*

cartagoa, Pholisora (Williams & Bell) 136*

castaneae, Swammerdamia 277

Cauratettix (*see* gracilis)

Celaenorrhinus (*see* approximatus)

Ceratonia 191

Ceritinia *188*, 192*
(*See also* jemina, xanthostola)

chilensis, Rhammatocerus 103

Chordis 191

Choreutis (*see* augustella, melanifera, multimarginata)

cladothricis, Belomicrus, *Oxybelus* 42, 64*, 213

clearista, Athesis 177

coeno, Hyalyris 187*

colorato, Belomicrus 33

coloratus, Belomicrus 33*, 214

columbianus, Belomicrus, Oxybelus, Oxybeloides 21

comanchi, Aphodius (Robinson) 146

concinnus, Eutrichopleurus (Blaisdell) 321

contractus, Trox (Robinson) .. 153*

convexus, Ataenius (Robinson) 149

cookii, Belomicrus 29*, 216

Corbulis 195*, *199*

corumba, Pholisora (Williams & Bell) 131*

crassicornis, Trichochroides (Blaisdell) 300*

crassus, Belomicrus, Nototis ... 243

crathis, Olyras 176

cruxifera, Ithomia 184

cruza, Pholisora (Williams & Bell) 130*

cucamonga, Belomicrus (Pate) 76*, 216

cyanipes, Rhammatocerus 103*

Cycloplasis (*see* immaculata)

Cyclosemia (*see* pedro)

cymothoë, Miraleria 186

cyrianassa, Napeogenes 191

Czakia 178

dentibius, Trox (Robinson) .. 156*

dercyllidas, Dicenna 178*

diabloensis, Oreopasites (Linsley) 315

diaphane, Hymenitis, *Papilio* .. 203

Dircenna 196*
(*See also* callipero, dercyllidas)

Dismenitis 200

drymo, Ithomia 185

duillia, Godyris 200

Dynothea 188

Ebrietas (_see_ niger)
egina, Melinaea 178*
Elsunia 176*
Enchemicrum 257
Epacromia (_see_ Scyllina)
Epileria 192
Epimetes 181
Episcada 198*
Epithomia 195
Epityches 188
Eracon (_see_ problematica)
erinaceus, Trox 151
eriogoni, Belomicrus (Pate) 70*, 213
Ernicornis 197
euchytma, Dircenna 197*
Eudasytes (_see_ brunnipilosa)
Euplectrottix (_see_ ferrugineus)
euphorbiae, Oreopasites 311*
eupompe, Tritonia 188
euritea, Papilio 197
euryanassa, Placidula 187*
Eutresis 179*
Eutrichopleurus (_see_ concinnus)
excavatus, Aphodius (Robinson) 143
excelsa, Napeogenes 187
excisus, Belomicrus 245

falsus, Trichochroides (Blaisdell) 292*
fasciatus, Belomicrus, Oxybeloides 243
femoralis, Belomicrus 229
fenella, Heteroscada 183
ferrieria, Belomicrus 233
ferrugineus, Euplectrottix ... 114
forbesii, Belomicrus 20*, 211
foveicollis, Trox 152*
franciscus, Belomicrus. 50*, 212, 215
funebris, Polistes (Bequaert) .. 269
funestus, Belomicrus, Oxybelomorpha 233
furia, Tithorea 175*

Garsauritis 191
gazoria, Heteroscada 183
gemmulatus, Trox 151
genetyllis, Rhadinoptera 203
gephiria, Corbulis 199
Glyphipteryx (_see_ californiae, montisella, saurodonta)
Godyris 200*
Gomphocerus (_see_ peragrans)
gracilis, Cauratettix 114
gregarius, Stenobothrus 105
Greta 203*

hamatus, Trox (Robinson) ... 154*
harmonia, Tithorea, _Papilio_ ... 175
Helias (_see_ aurocapilla)
Heliopetes (_see_ macroides)
Herringia 199
Heterosais 204*
Heteroscada 183
hezia, Callithomia 195*
Hilarographa (_see_ olympica, youngiella)
Hirsutis 175
huigra, Pholisora (Williams & Bell) 134*
humilis, Scyllina, _Oedipoda_ 111
Hyalothyrus (_see_ neleus)
Hyalyris 187*
Hymenitis 181, 203
hypereia, Eutresis 179*
Hypoleria 199*, 203
Hyposcada 193*
Hypothyris 188*

iambe, Dircenna 196
iguala, Pholisora (Williams & Bell) 137*
ilerdina, Leucothyris 193
immaculata, Cycloplasis (Braun) 275
indonesicus, Polistes (Bequaert) 267
inermis, Aphodius (Robinson) . 147
insularis, Trox 152
integer, Trox 151
istam, Belomicrus (Pate) .. 81*, 213
italicus Belomicrus 12, 245

Ithomia 185*
(*See also* adelphina, agnosia, agrippina, aletta, cruxifera, nephele, pollissena, pusio, salonina, salvinia, singularis, stella, tutia)
Ithomiinae 161

jemina, Ceratinia 196
jurumpa, Belomicrus (Pate) 53*, 211

kohlianus, Belomicrus, Oxybelomorpha 240
kohlii, Belomicrus, Oxybelomorpha 223, 242

lacydus, Anastrus 126
Languida 203
larimerensis, Belomicrus 21
Lautara 222
Leucothyris 193
libera, Hypoleria 199
liebermanni, Scyllinops (Rehn) 114*
lycaste, Dynothea 188

macaroides, Heliopetes (Williams & Bell) 139*
madrea, Philosora (Williams & Bell) 135*
magnificens, Aphodius (Robinson) 144
marleyi, Belomicroides 8
maurusius, Belomicroides 9
Mcclungia (Fox) 201*
Mechanitis 181*
mechanitis, Athyrtis 180*
melanantha, Oreopastites (Linsley) 316
melanifera, Choreutis 274
Melinaea 178*
mendiatrix, Czakia 178
mescalero, Belomicrus (Pate) 87*, 216
Methona 180
meyeri, Belomicrus 230
mimus, Polistes (Beqauert) 272
minidoka, Belomicrus (Pate) 79*, 213
minutissimus, Belomicrus 240
Miraleria 186*
mirificus, Belomicrus, Oxybelomorpha 244
mirza, Hypoleria 200*
modesta, Oleria 194*
modestus, Belomicrus, *Oxybelus*, Oxybeloides 230
mono, Belomicrus (Pate) . 46*, 215
montagui, Olyras 177*
monticola, Trox (Robinson) .. 158*
montisella, Glyphipteryx 274
moricei, Belomicrus, Oxybelomorpha 241
muiri, Trichochroides (Blaisdell) 291*
multimarginata, Choreutis 274
mystecus, Rhammatocerus 103

Napeogenes 191*
(*See also* excelsa)
naranjapata, Pholisora (Williams & Bell) 133*
neleus, Hyalothyrus 126
nephele, Ithomia, *Heterosais* ... 204
Nereis 181
neso, Ceratinia 192
niger, Anastrus 126
niger, Ebrietas (Williams & Bell) 127*
nigra, Apis 252
nigrosericans, Polistes (Bequaert) 266
ninonia, Hypothyris 188*
Niteliopsis 222
nodosus, Trox (Robinson) 152*
Nototis 12, 224
(*See also* Belomicrus)
nunenmacheri, Trichochroides (Blaisdell) 294*

obscura, Scyllina, *Stirapleura* .. 111
obscurus, Belomicrus, *Oxybelus*, Oxybeloides 230

Ocyba(*see* sula)
odontophorus, Oxybelus, Oxybeloides 232
Oedipoda (*see* humilis, stgnatipennis)
Oleria 193*
Oleriini 164
oligonus, Trox 151
olympica, Hilarographa 274
Olyras 176*
Omorgus (*see* Trox)
Onthophagus (*see* subopacus)
Oregenes 187
Oreopasites, Revision of 307
  Key to species 308
Oxybelini 3
Oxybeloides 12, 221
  (*See also* columbianus)
Oxybelomorpha *12*, 221
Oxybelus *12*
  (*See also* cladothricis, columbianus, modestus, obscurus, odontophorus, parvulus, 4-notatum, radoszkowskyi, subulatum, unigiume)

pachappa, Belomicrus (Pate) 73*, 216
pallida, Scyllinops 112
palpalis, Trichochroides, *Trichochrous* 298*
pamina, Ceratinia 188
panamintensis, Trichochrous (Blaisdell) 323
Papilio (*see* astraea, diaphane, euritea, harmonia, polymnia)
Papyris 185
paradoxa, Pseudomechanitis 205
Parapteronymia 197
parnassiae, Zelleria (Braun) 277*
parvicollis, Trichochroides (Blaisdell) 301*
parvulus, Belomicrus, *Oxybelus* 229
Patricia (Fox) 177*
pavonii, Elzunia 176*
pedro, Cyclosemia (Williams & Bell) 125*
Pellicia (*see* pollardi)
peninna, Velamysta 185
pennsylvanicus, Aphodius (Robinson) 148
penuti, Belomicrus 211
penuti, Belomicrus forbesii (Pate) 27
peragrans, Scyllina, *Gomphocerus* 108*
peridia, Chordis 191
persa, Belomicrus, Pseudoxybelus 223, 240
philippinensis, Polistes 268
Philosora (*see* astra, aurocapilla, buena, caribbea, cartagoa, corumba, cruza, huigra, iguala, madrea, naranjapata, sinepunctis)
phyllodoce, Salacia 183
pictus, Belomicroides 8
Pigritina 199
Pigritia 199
Placidula 187*
platycyphus, Trox 150
Platyderides (*see* Aphodius)
Plectrotettix 105
Plenoculus 222
Pletrophorus 105
plicatus, Trox (Robinson) 153*
Polistes (*see* funebris, indonesicus, mimus, nigrosericans, philippinensis, sagittarius, sibuyanensis, strigosus, tenebricosus)
pollardi, Pellicia (Williams & Bell) 123*
pollissena, Ithomia 203
polymnia, Mechanitis, *Nereis, Papilio* 181
prosopidis, *Belomicrus* (Pate) 72*, 213
praeceptrix, Mcclungia (Fox) 201*
problematica, Eracon (Williams & Bell) 122*

Pseudomechanitis 205
Pseudoscada 203*
Pseudostauronotus 105
(*See also* brunneri)
Pseudoxybelus *12*, 223
psidii, Thyridia 180
psidii, Xanthocleis 181*
Pteronymia 197*
pusio, Ithomia 203
4-notatum, Oxybelus 242

quemaya, Belomicrus (Pate) 47*, 212
querecho, Belomicrus (Pate) 36*, 210

radiatus, Belomicrus, Brimocelus 9
radoszkowskyi, Oxybelus 243
Rhadinoptera 204
Rhammatocerus 105
(*See also* brunneri, cyanipes, mystecus, tepanecus, viatorius)
rhodesianus, Belomicrus, Oxybelomorpha 241
Rhodussa 188
rosalia, Sais 182
rufiventris, Belomicrus, Oxybelomorpha 242
ruidosa, Argyresthia (Braun) . 275*

sagittarius, Polistes 267
Sais 182*
Salacia (*see* phyllodoce)
salina, Scyllina, *Stirapleura* 110
salonina, Ithomia 201
salvinia, Ithomia 198*
santschii, Belomicroides 8
saurodonta, Glyphipteryx 274
saylorea, Aphodius (Robinson) . 147
scabricollis, Trichochroides (Blaisdell) 290*
Scada 183*
schmiedeknechtii, Belomicroides 6
schulthesii, Belomicrus 240
scituli, Oreopasites 309
Scyllina 105
Scyllinops 112
Scythris (*see* albilineata)
sechi, Belomicrus (Pate) .. 60*, 212
serrano, Belomicrus (Pate) 42*, 211
serval, Aphodius 148
sexualis, Trichochroides, *Trichochrous* 297*
sibuyanensis, Polistes (Bequaert) 266
signatipennis, Scyllina, *Oedipoda* 111
Silaon 222
simi, Trox (Robinson) 157*
sinepunctis, Pholisora, *Staphylus* 128*
singularis, Ithomia 192
Solierella 222
sordidus, Belomicrus 243
sisunga, Godyris 200*
spinulosus, Trox (Robinson) .. 156*
subopacus Onthophagus (Robinson) 142
subulatum, Oxybelus 252
sula, Ocyba (Williams & Bell) 121*
suturalis, Trox 150
Staphylus (*see* aurocapilla, sinepunctis)
steckii, Belomicrus, Oxybelomorpha 323
stella, Ithomia 191
Stenobothrus (*see* gregarius, viatorius)
Stirapleura (*see* obscura, salina, variabilis)
strictus, Aulacobothrus 114
strigosus, Polistes (Bequaert) . 269*
sylvella, Miraleria 187*
Swammerdamia (*see* castaneae)

tenebricosus, Polistes 265
tepanecus, Rhammatocerus 103
terrestris, Trox 152*
tesselatus, Trox 150
texanus, Trox 150
theaphia, Scada 183
themisto, Thyridia 180*
thuiella, Argyresthia 276

Thyridia 180*
timberlakei, Belomicrus (Pate) 91*, 213
Tithorea 175
Tithorenini 163
transversus, Aphodius (Robinson) 145
Trichochroides, Species of 285
  Key to species 286
Trichochrous (*see* palpalis, panamintensis, sexualis, vanduzeei)
Tritonia 188
Trox (*see* aciculeatus, aequalis, affinis, contractus, dentibius, erinaceus, foveicollis, gemmulatus, hamatus, insularis, integer, monticola, nodosus, oligonus, platycyphus, plicatus, simi, spinulosus, suturalis, terrestris, tesselatus, texanus, umbonatus, variolatus)
tuktum, Belomicrus (Pate) 84*, 213
turneri, Belomicrus, Oxybelomorpha 241
tutia, Ceratinia 193*
tutia, Ithomia 192

ulla, Papyris 185
umbonatus, Trox 150
umbraticola, Rhadinoptera 199
uniglume, Oxybelus 252
utilla, Pseudoscada 203*

vanduzeei, Oreopasites 314
vanduzeei, Trichochroides, *Trichochrous* 295*
vanyume, Belomicrus (Pate) 17*, 214
variabilis, Scyllina, *Stirapleura* . 111
variolatus, Trox 151
Velamysta 184*
vernalis, Oreopasites (Linsley) . 317
viatorius, Rhammatocerus, *Stenobothrus* 103*
vierecki, Belomicrus (Pate) 56*, 212
virilis, Trichochroides (Blaisdell) 303*

waterstonii, Belomicrus 240

xantho, Corbulis 195*
Xanthocleis 181*
xanthostola, Ceratinia 191
xerophila, Oreopasites (Linsley) 318
Xyrosaris 277

youngiella, Hilarographa 274

zavaleta, Dismenitis 200
Zelleria (*see* arizonica, parnassiae)
zibia, Scada 184*